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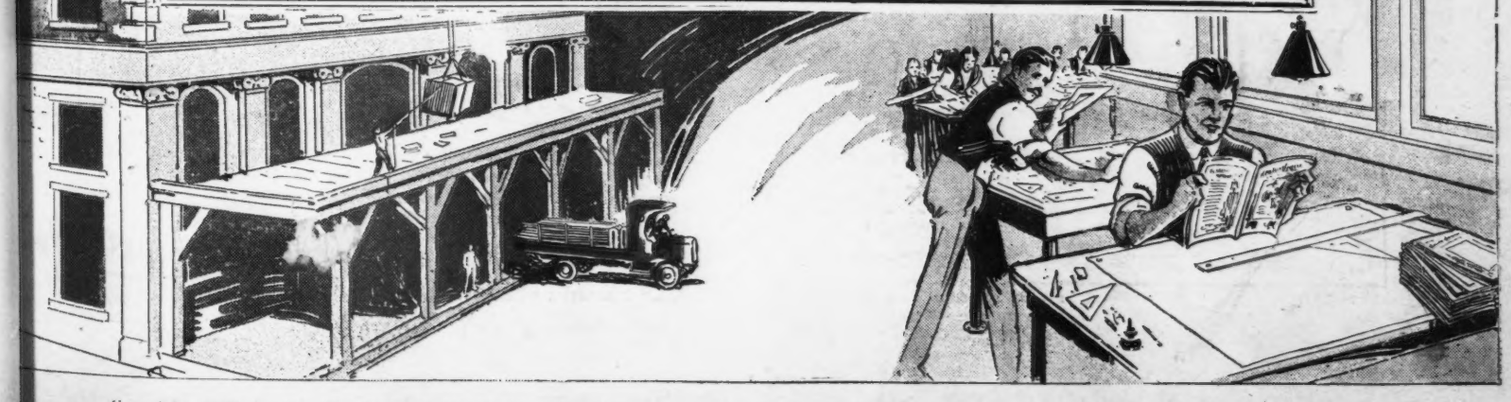

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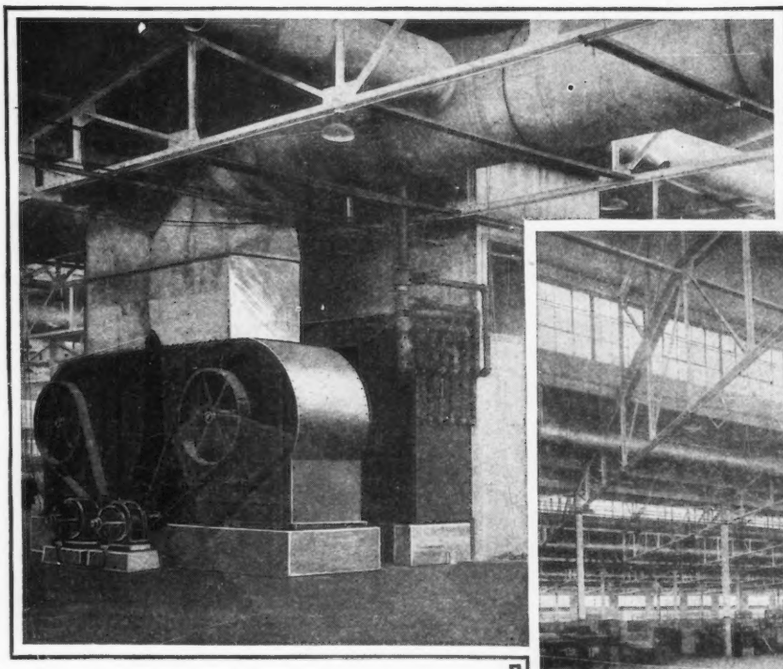

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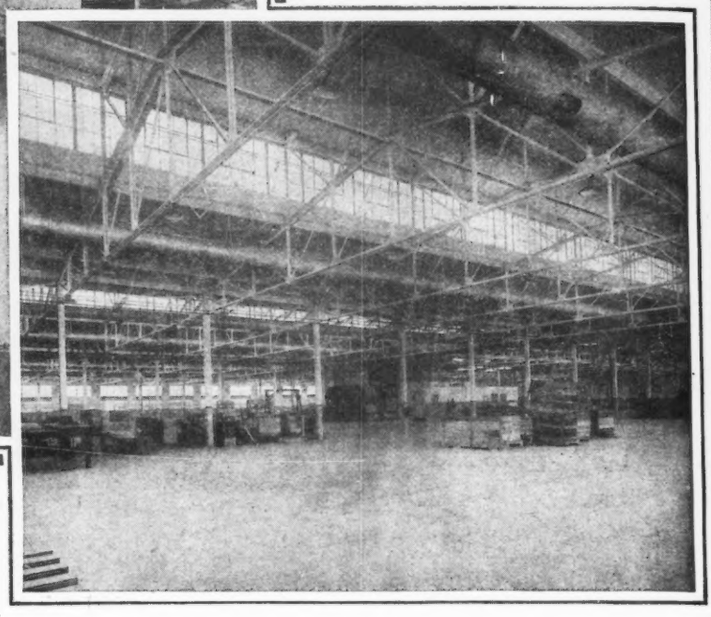

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FUNCTIONS OF THE ORIFICE IN STEAM AND WATER HEATING

I—Fuel Conservation Through the Use of the Fixed Orifice and Variable Steam Pressure

By S. HOMER WOOLBRIDGE

EDITOR'S NOTE—*This is the first of two parts of a paper by Professor Woodbridge on the use of the fixed orifice in heating systems using steam or water. In natural sequence it follows the paper by Charles L. Hubbard describing the heating system as planned and specified for the new Washington Cathedral (published in* THE HEATING AND VENTILATING MAGAZINE *for April and May, 1920). The second division of the paper will cover the use of certain forms of modulating valves to serve as combined fixed orifice and stop valves in steam and water heating systems.*

ONE of the many problems of growing seriousness confronting the designing and the operating engineer is that of waste prevention. Among the larger and more preventable of modern wastes in things material is that of fuel, a waste that begins in the mining, attends the transportation, and ends in the using of coal for both power and heating purposes.

The world's daily consumption of fuel approximates an equivalent of 5,000,000 long tons of coal, which may be roughly represented by a continuous train of fully loaded cars one thousand miles in length. It is but necessary to so visualize such a daily draft upon the world's supply to impress upon the imagination the rate at which it is being consumed, and at which one of the world's great sources of available energy is approaching exhaustion.

One purpose of this paper is to present a method successfully employed for reducing the waste of heat, and therefore of fuel, in the warming of buildings. For the reason that properly-designed heating systems are intended to provide a rate of thermal output equal to the maximum rate of heat losses from the buildings to which they are adapted, the opportunity for waste in weather milder than the coldest is abundant. The remedy lies in providing a reliable and surely controllable thermal output by installed heating systems which shall be equal to, and which shall not exceed, the normal rates of heat loss by the buildings served.

METHODS OF CONTROLLING WARM AIR AND WATER HEATING SYSTEMS.

Some methods of heating afford simpler and better means for controlling thermal output than do others. Generally speaking, they are those in which control through manipulation is reduced to a minimum, in which the human factor is as far as possible eliminated. The heat yield from a warm-air furnace system may be, and commonly is, controlled at one point, the furnace, by the intensity of draft used, and by the service of a single attendant. So also in the case of a water heating plant, the control may be wholly at the boiler, by a regulation of the temperature of the circulating water in close accordance with the fluctuation of the weather temperature, the cloudiness, the force of wind—all factors in affecting the rate of heat loss by buildings.

In that feature of water heating, the ability to control at one point the thermal output of the entire system to exactly match the heat loss by the building to which it is correctly adapted, and also in the lower temperature of the water "boiler" than that of a steam boiler doing the same work, lies the higher economic operating value of water heating than that usual, or generally possible, in steam heating. In the case of water heating systems the control may be, and most frequently is, at one point, the boiler room, and by one operator, the fireman. A greater economy in the use of fuel for heating purposes is hardly possible than that attainable in the use of a water heating system successfully designed, installed and operated.

POSSIBILITIES IN CONTROLLING STEAM HEATING SYSTEMS.

In the case of steam systems, the thermal output from radiators and convectors is commonly controlled by valves locally operated. In rooms large or exposed enough to require more than one radiator, the thermal output may be regulated by the number and the surface of the radiators steam filled. If three radiators in one room have relative surfaces 1, 2, 4, it becomes possible, by means of such division of surfaces and the several combinations they afford, to produce relative thermal outputs 1, 2, 3, 4, 5, 6, 7. Where the heating is done by pipe surface ranged along the walls of an enclosure, that surface may be so connected into valved manifolds as to effect the same surface combination and range of thermal output. Such equipments, however mechanically ideal they may be, are practically unreliable because of the too general failure of the human factor to which the regulation must be entrusted.

SUBDIVISION OF HEATERS FOR WARMING TEMPERED AIR.

In the author's experience such subdivision of heaters has been found to be far more successful in the case of convectors for warming air for ventilating work than in the case of radiators for heating service because of the far less number of valves to be manipulated. Thus in a convector designed to raise 72,000 cu. ft. of air per minute from 0° to 70° F., 980 pipes, 15 ft. in length, including expansion pieces, may be arranged in the following manner:

The steam and condensation headers are made up in the manner shown in Fig. 1. These headers are each made for fourteen pipes connections, and five headers are grouped into one manifold for steam, and into another for condensation, and each sub-group of fourteen pipes is connected for removal and repair, and each group of 70 pipes is valved for cutting out for that purpose, but not for temperature control. This arrangement provides a wall of 140 pipes one pipe deep under the control of valve No. 1; another wall of 280 pipes, two pipes deep under the control of valve No. 2; and a third wall of 560 pipes four pipes deep under the control of valve No. 3. For an outside temperature of 60° and to raise the air passed through the heater to 70° F., valve No. 1 is opened; for outside 50°, valve No. 2; for outside 40°, valves Nos. 1 and 2; for 30°, valve No. 3; for 20°, valves Nos. 3 and 1; for 10°, valves Nos. 3 and 2; for 0°, valves Nos. 1, 2 and 3. This arrangement, combined with changes in steam pressure to fill in the interval requirements between the 10° stages, has been found to give a well-nigh complete control of the temperature of air passed through the heater at a fixed and predetermined rate of flow.

In some forms of convectors the same effect may be produced by mixing dampers, either automatically or manually-operated.

EFFECT OF OPENING WINDOWS.

So also in the case of direct heating by radiators, the human factor may be practically eliminated by the employment of reliable thermostatic means for temperature control, and generally to the decided economic advantage of the operating of the systems in which they are incorporated. The large initial costs of such installation, and, with some makes, the maintenance charges, are make-weights against the general employment of this method. However perfect in design, workmanship and action, thermostatic control is in one important respect inherently defective as a contributor to economy. If the windows of a room or a building are thrown open, or the location in which a thermostat is placed is cooled by currents of admitted outside air, the radiator or the convector valves will remain open, and a full supply of steam will be fed to the heaters as long as the condition described is maintained. It is supposedly a function of the thermostat to prevent that rise of temperature within enclosures which tends to relief by opening windows, but, once the windows are opened, the thermostat does its utmost to prevent a temperature condition within the room affected which would tend to a closing of windows.

The monotony of an unchanging evenness in air, even of the purest quality, in a static temperature, though supposedly ideal, becomes in time, oppressive and gives a sense of stagnancy, simply because of the physical and normal demand for stimulating variety. As surely as it is true that prolonged static conditions within a room induce demands for relief through visible connection with outside air, windows are likely to be thrown open unless held fast by rigid rules or binding nails.

Whatever among the methods of temperature control thus far described may be used, there is nothing in their functioning which compels the closing of windows or doors because of discomfort attending such opening. If, on the other hand, the heat yield from radiators or convectors be made only that required for maintaining any desired temperature within rooms under *normal* conditions of heat loss, the opening of windows or doors would quickly result in such chilling as to insure an early closing of those abnormal avenues of heat escape.

ADVANTAGES OF THE FIXED ORIFICE.

A very simple and effective method of temperature control, which involves a minimum of manipulation and of dependence on that most unreliable of operating agents, the human factor, and which reduces to as low a degree as can any method the impulse to open windows, and which automatically compels the closing of all abnormal ways of heat loss, is that which employs the fixed orifice and the variable pressure for the supply of steam to heaters. The "modulating" valve method of temperature control, as that method is generally applied and employed, may be generically described as a variable orifice with fixed steam pressures. Mechanically, that method is complete, and all sufficient. Practically, it is defective, because dependent on as many human factors as there are valves to be manipulated. The too common result is that the valves are not used to "modulate," or to vary the steam-way aperture, but as opening and stopping valves, being thrown to wide open or to tight closed. In the large majority of cases examined the exceptions to that procedure have been relatively few.

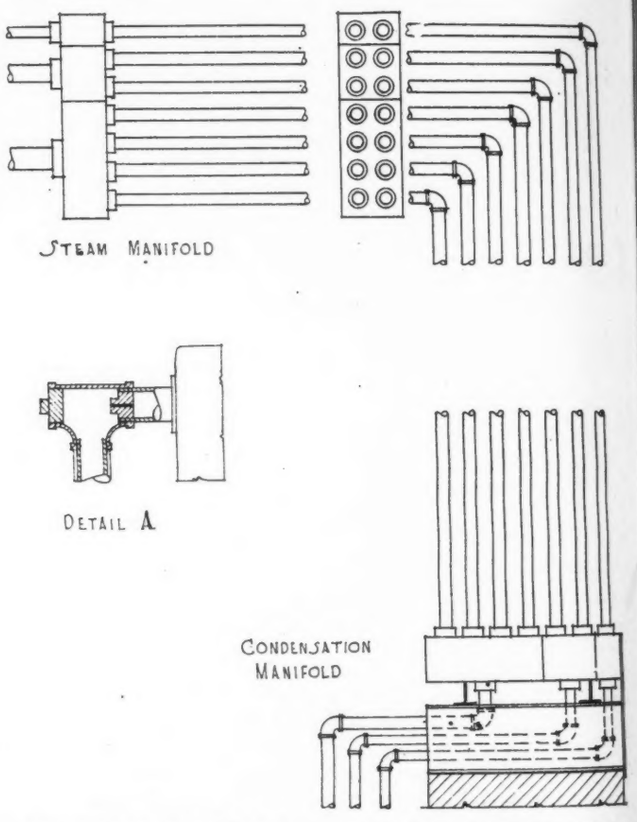


FIG. 1—ARRANGEMENT OF STEAM AND CONDENSATION HEADERS WITH DETAIL OF FIXED ORIFICE.

The reverse method, that of fixed orifice and variable pressure, has certain and considerable advantages over that of variable orifice and fixed pressure. Let a system comprising ten, or a hundred, or a thousand radiators be so planned that each radiator when steam-filled at atmospheric pressure shall yield a thermal quantity equal to the full part it is designed to play in the severest of weather. Let the maximum pressure to be carried in the steam conveying and distributing piping be fixed at any point desired. Let the steam pass into each and every radiator through an orifice of such area that, when the steam in the piping is at the fixed maximum pressure, the quantity of flow will just steam-fill the radiator when

the condensation rate is normal. It is clearly evident that under a lower steam pressure in the piping the steam flow into all connected radiators will be reduced, and that such reduction follows very nearly the law of $Q \times \sqrt{P}$, where Q signifies (weight) quantity, and P pressure.

If a system is adapted for a maximum steam pressure of 1 lb. in piping in zero weather, the relative steam quantities and steam pressures called for under the several-named conditions of outside weather would be approximately as shown in Fig. 2.

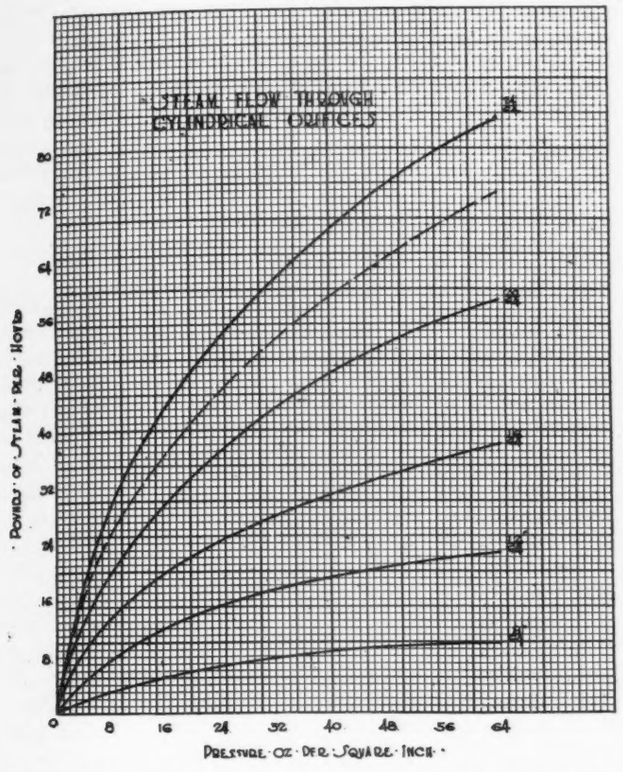


FIG. 2—CHART SHOWING VARIATION OF STEAM PRESSURES AND QUANTITIES UNDER VARIOUS WEATHER CONDITIONS.

A steam heating plant so designed and operated has in all respects thus far noted the simplicity and thermal flexibility of a water heating plant, and, with one exception, the operating economy of such a plant. At the boiler end of heating systems hot water has the advantage over steam because of the larger proportion of heat extracted from the combustion gases by the cooler fire surfaces of the water "boiler." Allowing 18 lbs. of air per pound of coal, and 300° F. rise of temperature in chimney gases above the air of the boiler room, one-tenth of the heat produced by a perfect combustion of the best of coals is passed to the chimney. Roughly, then, each 100° increase in that temperature rise adds between 3% and 4% to the loss through the chimney. The yearly average excess of temperatures of chimney gases escaping from a steam boiler running under 5 lbs. steam pressure above that of gases escaping from a water boiler with temperatures averaging 150° is 87°, representing a safely estimated excess loss of more than 3% chargeable to low-pressure steam heating.

OTHER FEATURES OF FIXED-ORIFICE METHOD.

A further economic advantage attaching to the fixed orifice method of supplying steam to heaters is in the possible elimination of all valve appliances for the feeding of steam to, and for the removal of air and of condensation from, such heaters. Both air and condensate may be passed by gravity through open and valveless pipe ways to the boiler room, the air there venting upward and the water flowing downward and entering the boiler either by gravity action or through a return trap or other mechanism adapted to conditions peculiar to each case. It is important that steam be kept from passing into return piping in sufficient quantity to pass into heaters through their open return connections, and to prevent such occurrence the surface of radiators and convectors may be increased for the purpose of condensing any surplus of steam supplied to them through any slight defect of orifice or pressure adjustment.

The method described commends itself because of its simplicity of design, economy of installation, flexibility of performance, reduction of waste through over heating, prevention of waste by any protracted openness of windows, and the elimination of that multiple factor of hand manipulation of many and scattered radiator or convector valves.

TYPICAL APPLICATION OF FIXED ORIFICE SYSTEM.

The first knowledge by the writer of a system of the kind under consideration was in a group of church buildings costing approximately $180,000 and intended to be as complete as modern art and science could furnish. The building committee, dissatisfied with all the many church heating systems examined, because of ill adaptation of means to producing results sought, and the consequent irregularity and inappropriateness of heating effects, proposed a dual system of water for mild and moderately cold weather, and of steam for use in severe weather. The employed engineer discouraged such complications and expense, as wholly unnecessary, and for a church auditorium seating 750, a Sunday School room seating 250, and entertainment room accommodating 175, a parish house containing two minor auditoriums ten class rooms and large culinary quarters beside rooms for choir, lockers, coat and toilet uses, he designed a complete steam system of the fixed orifice and variable steam pressure type, including a generous ventilating system for all five assembly rooms, all installed complete under a contract cost of less than 5% of the total cost of the church establishment. The auditorium is heated by eighteen concealed heaters of 185 sq. ft. each, to each of which steam is supplied through a bored bushing placed in the steam pipe connection with the radiator, and all are furnished with steam through piping under pressure, controlled by a single and easily accessible valve, the pressure carried being made to vary with weather conditions. The entire equipment in its several divisions is similarly arranged and operated.

PRINCIPLE USED IN DESIGN OF SYSTEMS FOR WASHINGTON CATHEDRAL.

The system planned for the National Cathedral, Washington, D. C., and described in THE HEATING AND VENTILATING MAGAZINE for April and May, 1920, by Charles L. Hubbard, is designed on the same principle. The proposed equipment is to consist of eighty-six convectors rated at more than 360 sq. ft. each, each supplied by steam through a fixed orifice, and through steam mains and branch lines aggregating a quarter mile in length, and the whole under the control of a single regulating valve by which the pressure of steam in the four mains and their runouts is under ready and reliable adjustment and holding. The arrangement insures an even and simultaneous distribution of heat throughout the great edifice, approximately 500 ft. in length, and in proportions desired for each of the five principal sections of nave, transepts, tower, choir and sanctuary, and for the four cardinal exposures. Were the heaters valved for steam supply and condensation discharge, two valves for each 150-sq. ft. of convector surface, a total of some four hundred valves in all the hopelessness of their scattered locations, the practical outcome of the heating because of the human factor would be made quickly manifest. The cost of the equipment; exclusive of the boiler plant and tunnel equipment is estimated at about 1.5% of that of the completed cathedral.

PRACTICAL FEATURES OF ORIFICES.

The method adopted for providing the orifices for the heaters in the systems thus far mentioned has been by means of bushings, or plugs, inserted in steam piping at or near the points of connection with the heaters. The standard internal diameter of a ¾-in. pipe is 0.824 in., and the external diameter of a ½-in. pipe 0.840 in., it follows that a tapered ½-in. screw plug can be forced by screwing into an unthreaded ¾-in. pipe. When that is done, the outside of the ¾-in. pipe can be threaded for connection with the heater. The plug can be bored to provide the required orifice for the heater to which it is to be fitted, and for the maximum pressure to be carried in the steam mains and runouts. To insure equality of pressure at all orifices, and especially where the mains are of long run, the sizes may well be based on ⅛-lb. drop for each 100 ft. of run and for the maximum rate of steam flow through

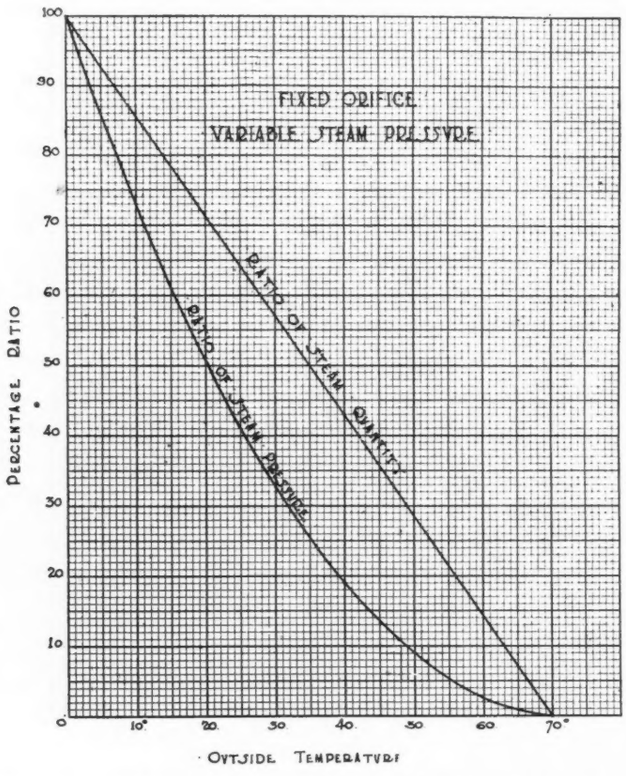


FIG. 3—CHART FOR COMPUTING REQUIRED DIAMETER OF FIXED ORIFICE.

them. There is then insured a practically uniform rate of steam inflow through all orifices and to all heaters, however numerous, connected with the mains, though they are hundreds of feet in length and whatever the steam pressure employed; whereas in such a system, piped and valved in the usual conventional manner, as the steam supply and pressure are lessened, the heaters nearer the source of supply may receive and condense the entire quantity of steam furnished, and, under all conditions of pressure, the major quantity of that steam. One office of the orifice is in making necessary such pressure to produce flow through it as to drive the steam through, and to steam-fill, the whole line of the piping, and so to effectively prevent any "lion's share" performance on the part of any heater or group of heaters along the line, however long or "numerously connected" it may be.

Because of the liability of orifices to become clogged by scale, filling material, core sand or other debris, it is important that borings be made readily accessible by some such means as the removal of a plug from a tee, rather than an elbow fitting, to be used in making up the heater connections, the bored plug or bushing being inserted between the fitting and the heater. Liability to such clogging may be reduced by using bossed plugs or bushings, the boring being through the center of the boss, the boss being of small size, and placed on the side of the steam approach. Detail A. Fig. 1.

RULES FOR COMPUTING DIAMETER OF ORIFICES.

The diameter of orifices required by any radiator or convector may be readily computed by use of the graphical table shown in Fig. 3, and based on a series of tests made possible by the courtesy of the United States Bureau of Standards, though not offered under the guarantee of the bureau. The table is deemed correct for all practical heating purposes, but for cylindrical borings only, that is, without tapering or chamfered approach or discharge ways, and when the tube lengths are approximately ⅝ in. The table is self explanatory, except in the case of the largest orifice. The dotted curve for that orifice is that derived from data obtained by the test. The solid curve is that computed from the data pertaining to the other four orifices. Apparently the "contracted vein" effect reduced the quantity flow by a greater factor through the largest orifice than through the smaller orifices, as the ratio of the diameter of the orifice to the length of tube increased. With the type of orifice in question it would therefore appear more safe to use the dotted than the full line curve for the 24/64-in. bore.

Tests carried on simultaneously with those undertaken for determining the rate of flow through orifices furnished data for establishing the rate of thermal yield from a radiator of the Peerless pattern, three column, 34 in. in height, when steam filled at atmospheric pressure, and air voided to a complete degree, and surrounded by reasonably quiet and dry air at 74° F. The rate was found to be 0.24 lb. of steam per hour per square foot of the rated surface of the radiator, making the thermal output 233 B. T. U. per square foot per hour; and 1.66 B. T. U. per square foot per hour per degree of difference between the steam within and the air surrounding the radiator.

If the problem is to determine the diameter of a cylindrical orifice of the type under consideration for a radiator of 100 sq. ft. and which would normally condense 0.24 lbs. of steam per square foot per hour, and when the maximum steam pressure to be carried in the mains is 16 oz., the point of intersection of the plot horizontal line for 24 lbs. with the vertical line for the 16-oz. pressure line, shows the diameter of the needed orifice is found to be 18/64 in.

(To be continued)

THE ADVANCE OF GAS FUEL IN THE HEATING INDUSTRY

IV Essential Factors of Design

BY DAVID H. CUYLER.

(Previous articles in this series were: "Notes on Methods of Computation, Design and Installation," September, 1920; "Efficiency of Gas-fired Heating Boilers," October, 1920; "Methods of Erection and Controlling Apparatus," November, 1920.)

AS an introduction to this fourth paper on the subject of gas fuel for heating purposes, the writer cannot refrain from quoting a few relevant sentences that appear in a report issued by the committee on information and service of the fuel section of the American Society of Mechanical Engineers. The statement as given is a quotation from Joseph E. Pogue, formerly scientist in charge of the investigation of energy resources for the Smithsonian Institute. After commenting upon the probable fracas that would result should each family in the United States be required "to throw away five $10.00 bills each year and then be fined $100.00 for the damage wrought by the indiscriminate manner in which the sums were cast to the winds," he goes on to say;—

> "Yet such is essentially what is now being done in this country when raw coal is burned in millions of homes and factories and countless columns of dense, black smoke are allowed to escape into the atmosphere to contaminate its purity; dilute its brightness and besmear the surroundings with soot and grime. The value of benzol, tar, ammonia and gas which is thus annually turned loose into the air in the United States is conservatively estimated at $1,000,000,000, while the damage to property, health and comfort occasioned by this waste is at least twice that figure, though it would be difficult to place a money value on the losses suffered by society, especially in cities, on that score.
>
> "It is altogether possible, however, to turn smoke from a liability to an asset, for with the upgrowth of municipal by-product fuel plants and the establishment of coal refining plants at the mine mouth, the requirements of home and factory may be met with smokeless fuel and at the same time the present smoke-forming constituents saved in the form of valuable commodities, to pave our roads, fertilize our fields, and run a goodly share of our motor cars."

Here is vision par-excellence, and good doctrine of a kind that we all need. It will not do for the progressive element of our engineering profession to be anesthetized by the self-sufficiency of some who dismiss the subject of the use of gaseous fuels with a thoughtless statement that such fuels cannot compete with coal in general, every-day usage. The fact of the case is that it is right up to the engineering profession to work out the many problems that offer restrictions, so that these fuels may be had of a quality and quantity that will insure maximum service at a minimum cost. That is what the future demands of us.

After digesting the foregoing scintillating hypothesis we may proceed with the subject-matter. This installment is intended to bring out some of the essential factors which denote the good or bad in the design of gas-fired heating systems.

IMPORTANCE OF REDUCING HEATING LOAD TO LOW LIMIT OF GOOD ENGINEERING DESIGN.

In the design of piping layouts for conveying both the heating medium and the fuel supply, we will again be required to add to those rules and formulas which have proved sufficiently reliable in the past; others which may be termed of a more precise and exact order. The writer will not presume to instruct the readers of this journal on the proper design and sizing of piping, but in continuing the consideration of water heating, which is in numerous ways more adaptable in gas-fuel practice, the basic thought that will govern every properly designed plant will be that we are to reduce the pounds of water to be heated to the lowest possible amount allowable in good engineering design. With gas as the fuel, the highly efficient and successful system is the one where the circulation is as nearly perfect as it can be, and where the heating load on the heater is as smal as possible.

SMALL GAS HEATERS USED IN PREFERENCF TO LARGE UNIT.

Gas-fired heating units are made for quite small capacities, some with a rating as low as 250 or 300 sq. ft. of water radiation, and the writer has many times found it advisable to use two or more of these small heaters, placed in different positions in the cellar, rather than one larger central unit. Such a design is shown in Fig. 1, this being an installation for an

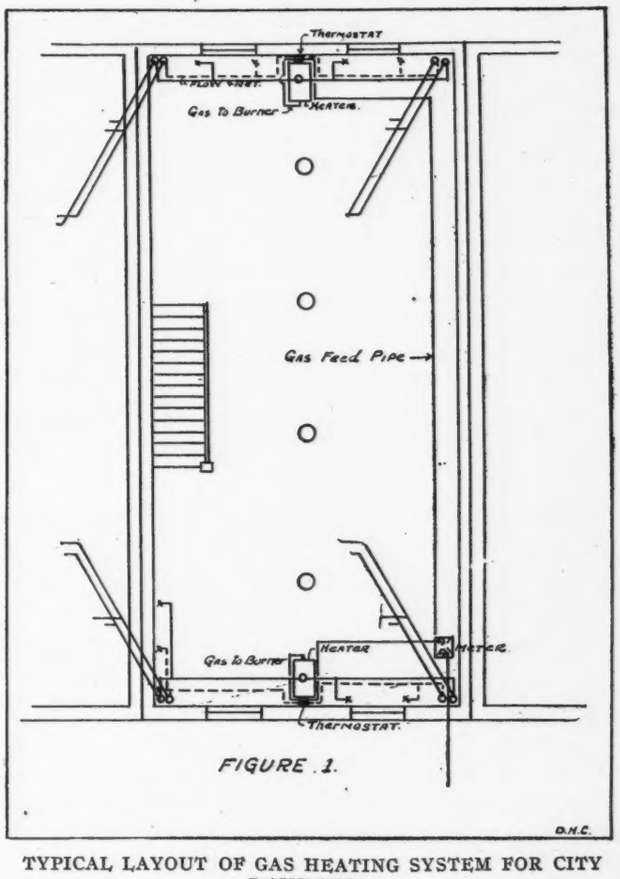


FIGURE 1.

TYPICAL LAYOUT OF GAS HEATING SYSTEM FOR CITY RESIDENCE.

ordinary city residence adjoining others on both sides and so presenting only front and rear exposures for heat loss computation. It will be noted that there are, in this case, two complete heating systems and that quite all large distributing and return piping has been eliminated. In this design it is safe to say that from 20% to 25% of the water heating load has been saved with nearly an equivalent addition to the efficiency of the plant.

USE OF ONE UNIT IN MILD WEATHER WITH MULTIPLE-UNIT SYSTEM.

Another advantage to be gained in such a design, or what we have termed the multiple-unit system; is that there are many days during the heating season when only one of the heating units will be required to warm the premises to a comfortable degree, especially if the wind pressure is against that side of the house where the system used is in operation.

These small gas-fired units are also applicable to any type of building where there is no cellar, or where it is desired to place the heating unit on the same level with th radiating surfaces. The heaters are of such a height and dimension that they can be placed in almost any corner where they can be easily reached for operating. One of the large boiler and radiator manufacturers has made quite a feature of a coal-fired device of this type, and the added attractions of gas-fired apparatus are obvious, it being 100% more cleanly and easy to operate, and the necessity for coal storage space is entirely eliminated.

DETAILS AND SPECIFICATIONS FOR GAS PIPING.

In the design of the water conveying piping, more than usual care should be given to the avoidance of friction and to the attainment of proper circulation. We can now take up the question of details and specification requirements for gas piping, an art that is perhaps not so well known by the heating fraternity. We are not concerned with the general layout of the gas piping throughout the premises, and only with that section of it attached to the gas heating apparatus, but the engineer designing such a system will be required to specify a service pipe and meter of sufficient capacity to supply an abundance of gas for all appliances in the building, so the following table of gas requirements for various appliances will be useful;—

Gas illuminating burners.....	5 cu. ft. each.
Top stove burners.....	15 cu. ft. each.
Oven burners.....	15 cu. ft. eacn.
Instantaneous water heaters.....100	cu. ft. each.
Gas grates and radiant fires.....	35 cu. ft. each.
Gas-fired heating boilers.....	As estimated.

A very casual review of the essential clauses to be covered in a well-written specification for gas piping equipment for heating work is covered in the following quotations from some of the best authorities:

Heater Connections—To be run directly from meter to the heater with no branches taken from it for other service. Piping to be of wrought iron of ample size to supply a waste of gas fuel at all times. Gas feed pipe from meter to the heater to be pitched towards heater and to be provided with drip and drain cock at heater. Fittings to be beaded malleable iron. No lead meter connections to be used. All pipe to be examined and blown out before erection and all ends to be reamed out so that no burrs will be left on inner surfaces.

Gas Meter—To be preferably a dry gas meter; of ample size; all connections to be of wrought iron and tube of full-bore. Meter to be set in cool, well-ventilated and well-lighted place, easy of access, and well protected from accidental injury.

Service Pipe—To be of wrought-iron of ample size; to be run into building with pitch back towards street main where possible, or if pitched towards meter, to be provided with drip pipe and emptying plug. Service pipes when 4 in. and over may be of cast-iron.

Shut-offs—Use best quality heavy brass, round-way, ground key lever cocks. Valves, if used, should be soft-seat brass valves. Iron valves should not be used on gas work as they corrode from action of the gas flow.

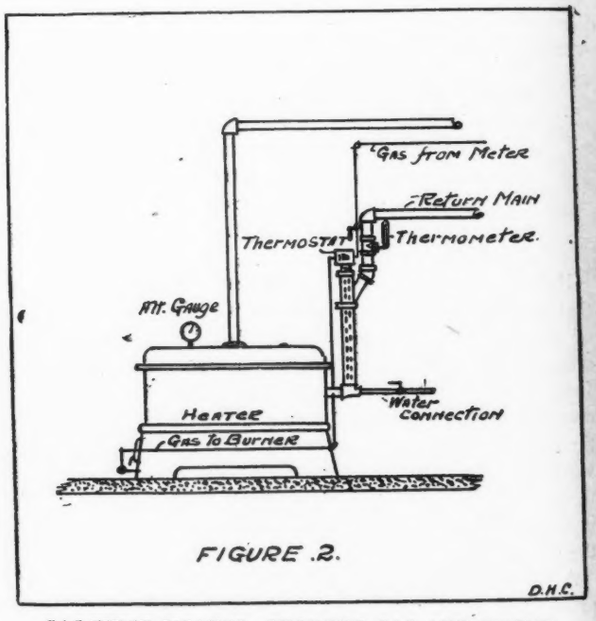
General Clauses—Beware of pockets in the gas mains. Perfect drainage should be provided throughout. No pipe cement to be used on joints under any circumstances. Use no unions on any part of the gas system if possible to avoid them, but if required, use only ground joint unions. No washer joints should be permitted. Joints to be screwed; made up with red or white lead or boiled linseed oil. Use no pipes less than 0.75 in. on the gas feed to heating system and make all horizontal mains from meter to vertical connection at least 1 in. in size.

Testing—All gas piping after completion should be tested with an air pump and a 22 in. mercury gauge. The piping system should be tested under a pressure equivalent to 18 in. mercury gauge (9 lbs. pressure). The piping system should be tight enough so that the mercury in the gauge will stand for one hour without indicating a fall of over 0.25 in.

Formulas and tables for sizing of gas feed pipes are given in article No. 3 of this series published in November. The faults of the past have been that the inclination has been to erect gas piping systems of far too small piping, and now that the heating engineer is advancing over the border-line of this heretofore recondite field, we may desire and expect a little of the ultra refining influence that our societies have given to our more familiar employment.

TYPICAL METHOD OF INSTALLATION.

Fig. 2 shows a gas-fired water heater fully connected to water and gas service, and will serve as a general drawing for methods; the exact location and run of pipes and the placing of utilities to be shifted to suit individual installations. The insertion type thermostat is shown, and we dwelt upon our preference for this type of controller in the last installment.



GAS-FIRED HEATER, SHOWING GAS AND WATER CONNECTIONS.

In designing water heating systems, we first compute and place the radiators. Then a very careful study is made of the structural conditions in an effort to get the connecting

pipes to and from the heater by the shortest route possible. When the design is completed and checked, we compute the approximate pounds of water in the system to be heated and, by the usual formulas, the heat unit requirement to raise this water through a predetermined range of temperature. This serves as a check on the method for computing heater and burner requirement as given in the first installment of this series.

This may all appear to be rather non-essential, but a little thought will demonstrate that while we do well in the effort to have our work result in a layout that will contain a minimum amount of water, it is quite possible for it to contain more or less than our burner equipment is designed to take care of, should we depend alone on the radiator transmission rule. We have learned through some very sad experiences that in gas heating practice, the old time-honored maxim that "an ounce of prevention is worth a pound of cure" is ultra-valuable to remember.

In considering insulation, here again we find ourselves in a land "of new resolves" and it behooves one to "remember the B. T. U. to keep it wholly." Little need be said further than that some good form of insulation should be used throughout the piping system in the basement or cellar and on such pipes as are concealed above. Money spent in good efficient insulating materials will result in savings in gas-fuel.

The next and final paper will be devoted to the use of gas-fuel for industrial purposes and processes.

THE CONSTRUCTION OF DUCTS FOR FORGE EXHAUST AND BLAST SYSTEMS

THE construction of ducts for forge exhaust systems is well brought out in the accompanying photograph, taken in the plant of the General Vehicle Company, in Long Island City. The smoke and gases from each of twelve forges is taken care of by means of a Y branch which connects to an overhead sheet metal main suction duct, while each hood is telescopic and counterweighted by an iron ring so that hoods may be raised or lowered as desired and any degree of exhaust obtained.

Incidentally, the photograph also shows the method of heating shops by means of overhead pipe coils when placed beneath the skylights to take care of down drafts. The coils are supported in a simple manner and are free to move with expansion and contraction of the coils and piping.

In schoolhouse work, the main suction duct for the forge exhaust system is often constructed of salt-glazed terra cotta pipes with bell and spigot joints, one-half the joint caulked with oakum and finished with one-two cement mortar. Pipes are supported on concrete saddles, one to each hub, the saddle resting upon concrete floors or platforms. Vertical tile ducts are fitted at the bottom with a supporting tee which is carefully bedded in a concrete base resting on the floor with 3-in. by ¼-in. clamps surrounding the pipe.

Branch pipes from the main tile suction duct to outlets in the floor under forges are made of standard cast-iron bell and spigot pipe having caulked and leaded joints hung from the floor construction by pipe hangers spaced 10 ft. apart. The discharge pipes from the forge blast fan to the inlets near

FORGE EXHAUST SYSTEM WITH TELESCOPIC HOODS THAT MAY BE RAISED OR LOWERED.

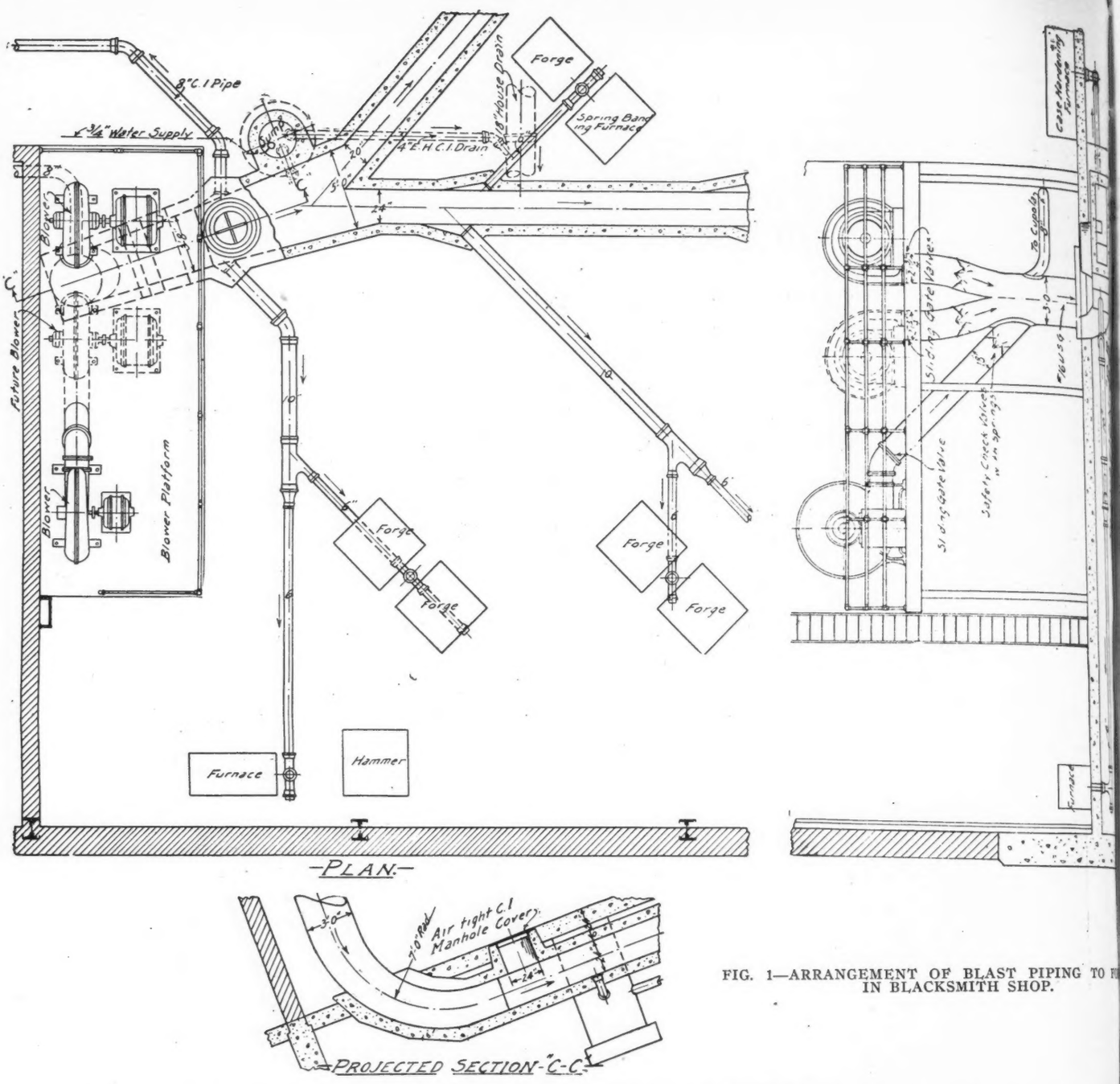


FIG. 1—ARRANGEMENT OF BLAST PIPING TO F IN BLACKSMITH SHOP.

forges are made of galvanized-iron screwed pipe with galvanized cast-iron drainage fittings.

Forge exhaust stacks are usually made of steel (self-supporting) and of ¼-in. plate for the first 50 ft. in height and 3/16 in. above this point, using angle and slip joints. The stack usually rests on a reinforced concrete slab 12 in. thick and about 18 in. larger than the stack all around while connection to the forge exhaust fan is made with a flanged joint and asbestos jacket 1 in. thick, with bolts fitted with lead washers under heads.

A stack of steel is most economical, the life being about ten years. It should be painted outside at least every two years (or one year depending upon conditions) with graphite paint. A considerable amount of air (500 cu. ft. per minute) is drawn in at each forge so that the stack temperature is much lower than it would be in the case of boilers.

In the West Albany Blacksmith Shops of the New York Central Lines, the blast piping is run under the floor with tile pipe enclosed in concrete ducts for the mains, while the branches are made with cast-iron pipe and fittings having bell and spigot caulked and leaded joints as shown in Fig. 1, Part Plan and Sections "B-B"—"C-C." The blowers are located on an overhead gallery and direct-connected to motors controlled by starting apparatus on the floor below. Connection is made from the blowers to the concrete duct by means of No. 16 U. S. G. sheet-metal pipes, while a sliding gate valve and safety check valve are placed in the discharge pipe of each blower. Underground cast-iron pipes for a single forge are not less than 6 in. in size.

Section "C-C" shows the method used in gaining access to the concrete ducts by means of air tight cast-iron manhole covers, while Fig. 2 shows a detail of the sump pit for duct drainage. The floor of the duct is pitched to drain to the 4-in. pipe, shown fitted with a clean-out and terminating near the bottom of the concrete sump. The water as collected in the sump from the duct system must be drained to the sewer without permitting the air from the fans to blow through and waste to the sewer. Consequently, a water seal is maintained in the sump by locating the 4-in. overflow above the inlet pipe and providing make-up to this level by means of a float valve located in a ¾-in. water supply line. Access to the sump is obtained

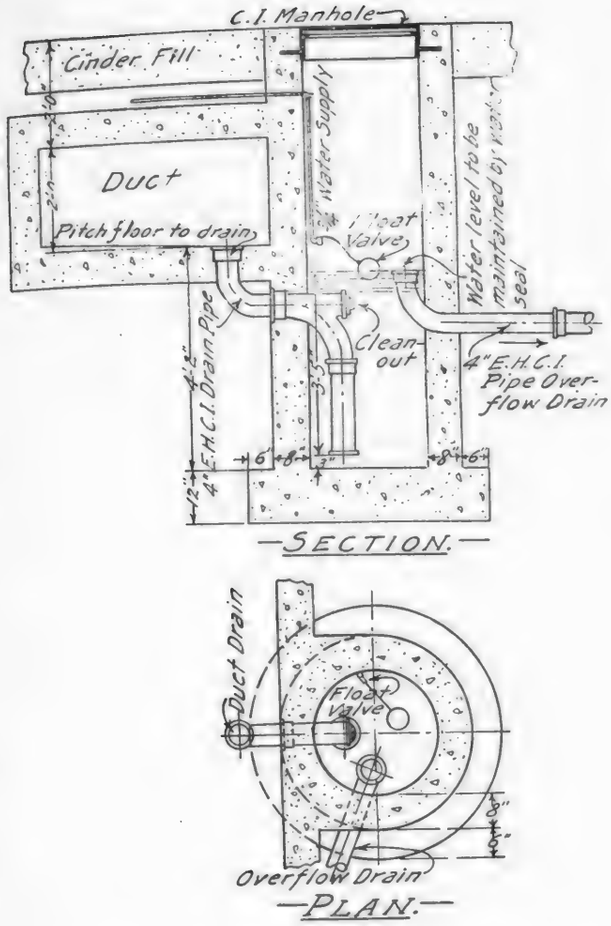


FIG. 2—DETAIL OF SUMP PIT FOR AUTOMATIC DRAINAGE OF UNDERGROUND DUCTS.

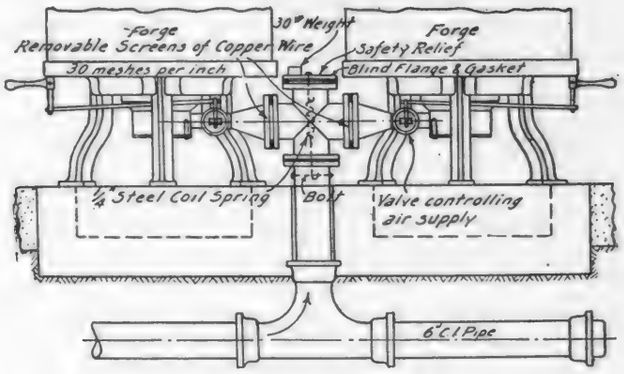


FIG. 3—TYPICAL ARRANGEMENT OF BLAST PIPING AT FORGES.

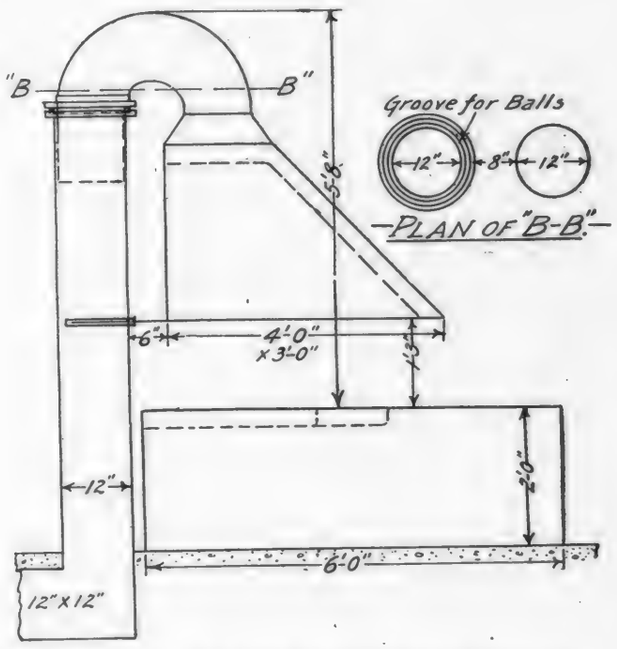


FIG. 6—DETAIL OF FORGE EXHAUST HOOD ARRANGED TO SWIVEL BY MEANS OF A BALL RACE.

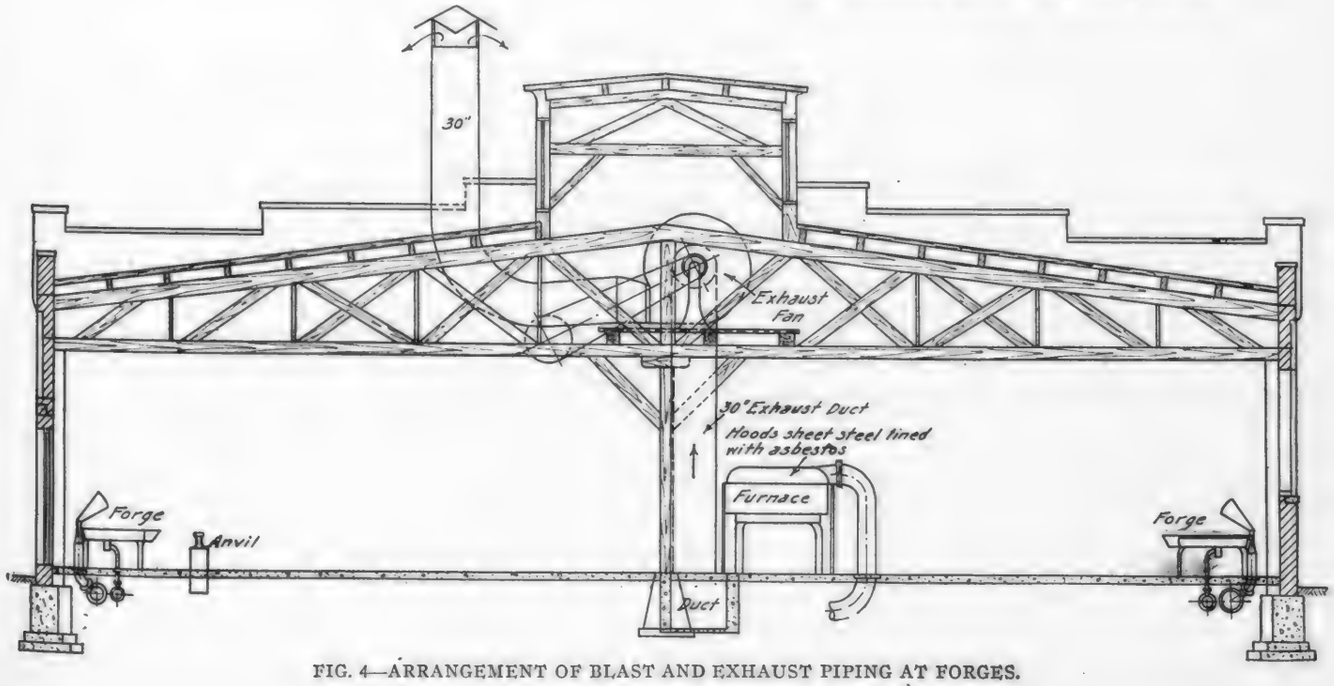


FIG. 4—ARRANGEMENT OF BLAST AND EXHAUST PIPING AT FORGES.

through an opening fitted with a standard cast-iron manhole cover.

Fig. 3 shows a typical arrangement of the cast-iron blast piping at forges. The end of the pipe run is fitted with a clean-out and the riser ends in a cross, the outlets of which are valved and connected to each forge by means of reducers equipped with removable copper wire mesh screens.

Coke or what is termed blacksmith's coke is required for burning in the forge and this is made during the night when the forges are idle merely by sprinkling water over the bituminous fuel bed of each forge. Consequently, the coal cakes on top and burns slowly till required in the morning, giving off in the meanwhile a gas which will lower and settle in the inlet pipe should the air supply valve of the forge be partially open. The latter is quite apt to occur, since in leaving the blowers at closing hours, a blacksmith may forget to fully close this valve. Thus, when the blowers are started in the morning, an explosion might take place of sufficient force to blow the fuel from its bed.

A pressure of 14 oz. is carried on this system and the air will merely blow back through the fan sides should the valves at all forges be closed at the same time. Therefore, no relief is required because of this, but safety valves are provided at the forges for the reasons previously given. One of these is located on the top of each cross, as shown in Fig. 3. Any material at hand of about 30 lbs. weight is placed on top of the cross so that this simple home-made safety device will relieve at approximately 20 oz. of pressure. The cross is capped at the top with a loose blank flange attached to a bolt with a ¼-in. coil spring. The other end of this spring is secured to a second bolt which in turn is held in place by a bolt placed through the cast-iron discharge pipe. Thus, any excess pressure will work against the combined resistance of the spring and weight, which, however, is less than the resistance of the deep fuel bed so that no disturbance of the latter may occur.

In Fig. 4, a method of exhaust is also shown, the furnace being equipped with a sheet-metal hood, lined with asbestos,

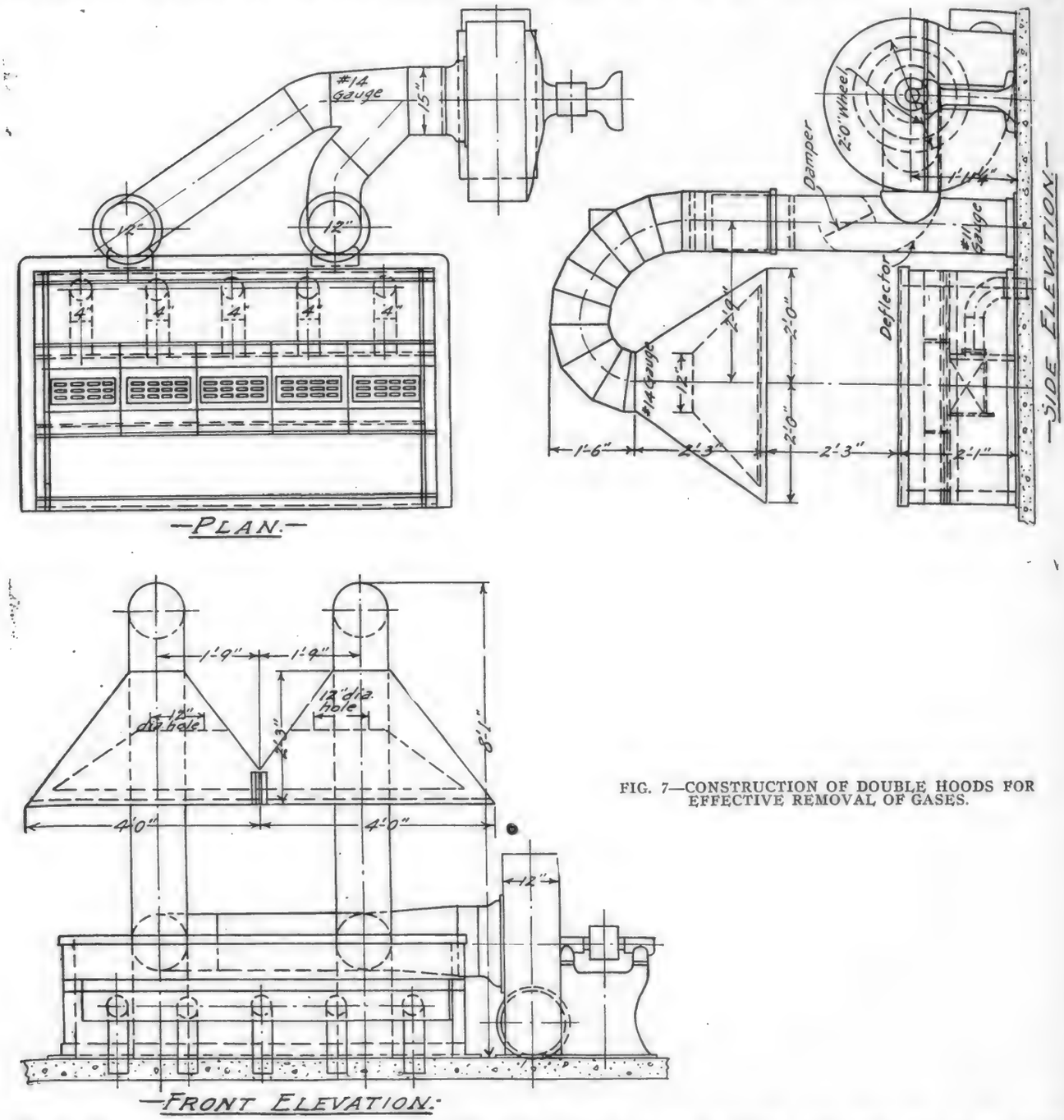


FIG. 7—CONSTRUCTION OF DOUBLE HOODS FOR EFFECTIVE REMOVAL OF GASES.

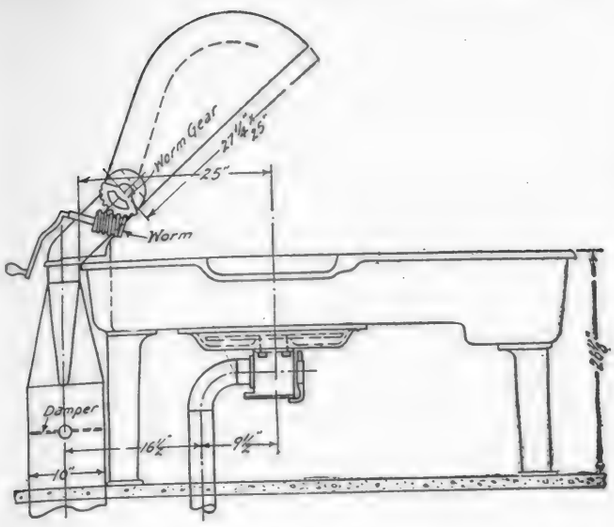


FIG. 5—ADJUSTABLE FORGE HOODS OPERATED BY WORM AND GEAR.

while the forges are provided with hoods made adjustable by worm and gear as detailed more fully in Fig. 5.

Figs. 6 and 7 show forges equipped with hoods swiveling by means of ball races. Each hood is also constructed with inner and outer casing so as to form a clearance or slot around the outside perimeter of the hood. The air rushing in at this slot effectively prevents the outward passage of smoke or gases.

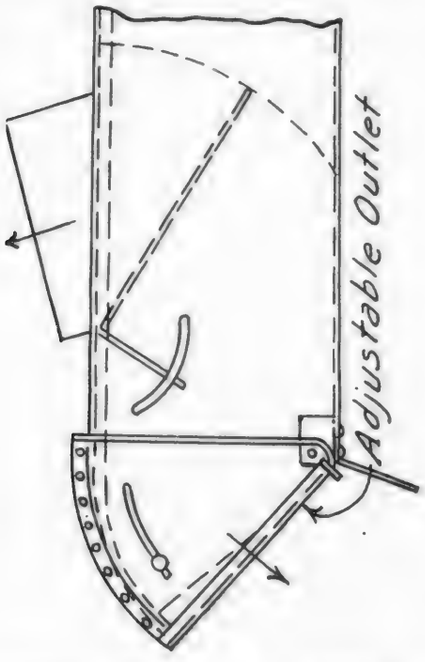


FIG. 8—ADJUSTABLE OULETS FOR AIR SUPPLY DUCTS OF VENTILATION SYSTEM.

The methods of air blast and removal as described herein are only for use in connection with manufacturing processes to provide for the removal of waste gases from forges and furnace, and, as required, the necessary air for rapid combustion. Air for general shop ventilation and heating is usually obtained by means of an additional separate fan connected to ducts terminating in drop pipes at building columns. It is desirable to make the outlets of the drop pipes adjustable (Fig. 8) and inclined at the proper angle so that the smoke and gases may be forced to the upper levels and escape through ventilator caps or monitor roof outlets.

Public Works Department Questionnaire

Early in the recent presidential campaign the American Association of Engineers submitted to both candidates the following questionnaire concerning the proposed Federal Department of Public Works:

1. Are you in favor of a National Department of Public Works, for the purpose of reducing and coordinating the present number of bureaus and commissions, and reducing the useless expenditures of money incident thereto?

2. Are you in favor of assembling and coordinating all the engineering and construction enterprises of the government (excepting the purely military works) in a department such as the National Department of Public Works, to the end that economy and efficiency will be obtained?

3. Do you favor the appointment of an engineer of recognized ability and unimpeachable character as a member of the Inter-State Commerce Commission?

4. Do you favor a progressive and constructive program of conservation and development of our natural resources?

5. Do you favor the budget system of appropriation of public funds?

6. Do you favor the reclamation of waste lands by drainage, irrigation, flood control or other methods?

Do you favor giving the settler the advantage of procuring the land by a sound financial system such as is provided by a rotating fund?

The reply of President-elect Warren G. Harding to this questionnaire is of special interest to those back of the movement, since he will have an opportunity to initiate any improvement in this direction which he may favor. His letter reads as follows:

Marion, Ohio, August 9, 1920.

Mr. C. E. Drayer, Secretary,
American Association of Engineers,
63 Adams street, Chicago, Ill.

My dear Mr. Drayer:

Your letter to Mr. Christian of August 4th has been brought to my attention.

It is not an easy matter for me to make a detailed reply to the inquiries conveyed in your letter and I do not care to enter into a categorical reply to questionnaires, no matter how friendly they may be and no matter how reputable and high standing is the source from which they come.

My theory of a campaign is, that a man's candidacy ought to be based on the formal and public utterances, though, of course, we are all of us informal enough to discuss informally many of the problems which are in the minds of various groups of our American citizenship.

I have had up the matter of the Department of Public Works in some personal interviews and quite agree with you that the question is an exceeding interesting and important one. I fear I should be unworthy of public confidence if I ventured to decide so important and far-reaching a question without the very fullest study. It involves the reorganization of several departments. Undoubtedly, there is necessity for this, but I should be very reluctant to unalterably commit myself to it without the very fullest of understanding.

You may be interested to know that I have already sent for the Congressional hearings on this particular question.

I may say, in a general way, that I think very well of the appointment of an engineer on the Interstate Commerce Commission and I have always spoken heartily in favor of a progressive and constructive program of conservation. I am sure you know that I favor the budget system and a very forward policy relating to reclamation and irrigation.

Very sincerely yours,

W. G. HARDING.

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THE ANNOUNCEMENT of a series of articles by Professor S. Homer Woodbridge, we are sure, will be welcomed by our readers. Professor Woodbridge's long and varied experience as a heating and ventilating engineer and the importance of much of the work he has designed, such as the heating and ventilation of the Capitol, in Washington, and the new Washington Cathedral, not only qualify him to an unusual degree to speak authoritatively on this subject, but have provided him with data on a wealth of interesting happenings and problems connected with his work that will make most interesting reading. Professor Woodbridge's first article appears in this issue.

ANOTHER announcement which we are able to make at this time is the forthcoming publication in THE HEATING AND VENTILATING MAGAZINE of the main portions of the course of training for janitors and custodians of school buildings, as outlined at the last summer meeting of the heating engineers' society by Edwin S. Hallett, chief engineer for the St. Louis Board of Education. The course represents a practical effort that has been made in St. Louis to secure efficient operation of the heating and ventilating plants installed in the school buildings in that city. The success and usefulness of the course may be gauged from the fact that in the matter of fuel economy, a saving of no less than $25,000 was effected in St. Louis over the figures for the previous year. Although started as a day course, the benefits derived by those in attendance soon led to the demand for night classes, and these were successfully held all last winter.

We feel fortunate in being able to present this course of instruction which has already stood the test of actual use. The articles will run through many issues and will cover such items as firing straight-grate furnaces, handling steam radiators, operation of pumps, operation of air washers, in addition to the care of steam, warm-air and water heating systems.

ONE OF the most concise statements that have come to our notice regarding the facts brought out by the Lockwood Committee, is contributed by C. A. Crane, secretary of the General Contractors' Association of New York, to the *Bulletin* of the Associated General Contractors. Mr. Crane summarizes the situation very clearly when he states that "the revelations adduced by the Lockwood Senate Committee on Housing are not pleasant for those contractors whose methods of price fixing have been exposed, nor for labor-leaders who have been accused of demanding a price to forestall strikes. Their plight, however, arouses no sympathy. Unfortunately, in besmirching themselves, the entire contracting industry is by implication besmirched in the public mind, on the assumption that the same practices obtain with all contractors. That result is as inevitable as it is true that the innocent must suffer with the guilty. The conviction of one merchant for profiteering leads instantly to the popular conclusion that every other merchant is doing it.

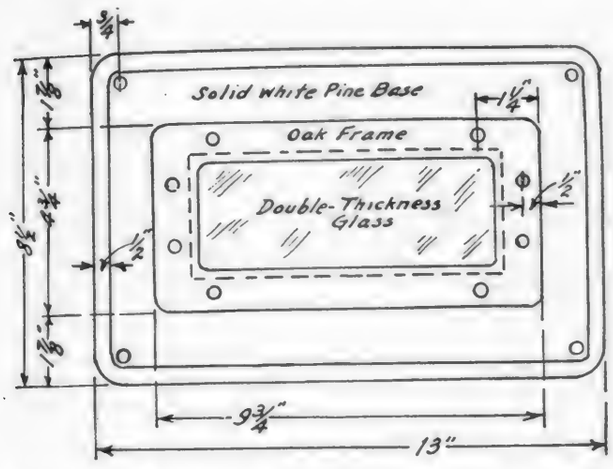
"The testimony so far given before the committee tends to show that two associations, plumbers and cut-stone contractors, required their members to pay into a central directing body 4% on the gross amount of their contracts; that all bids were forwarded for examination and advice to this central body before being submitted; that an attorney who acted as director of their operations received as his fee about ½% of the amount paid in and the balance went into an "insurance" or re-adjustment fund; that a close working alliance existed between these associations and the Building Trades Council which embraces all the unions of skilled trades in New York except the brick-layers, and that independent contractors found it impossible to get material or men to do their work until they joined the association, even though they employed none but union men and paid union wages, unless they bought the privilege to work from the boss labor-leader. One immediate result of the investigation was the cancellation of the contracts for the new court house superstructure, evidence tending to show the bid for the limestone work was agreed upon by nine limestone contractors, all of whom were to be taken care of in the bid."

It is too early as yet to form a judgment as to the disclosures of improper practices, to call them by no harsher term, that have been made before the committee, affecting the heating contracting trade, as well as other trades, in New York. If any unfair practices are in vogue it is needless to say that the committee will confer an immeasurable benefit on the industry by bringing them into the light of day as the most effective means of stamping them out.

WRINKLES

Maintenance or Guarantee Sign for Contract Work.

In connection with the suggested maintenance or guarantee notice presented in last month's issue, intended for use when heating and ventilating systems are installed by contract and under bond, providing both for maintenance and for the correction of all defects up to the date specified, the accompanying illustration is



DETAIL OF MAINTENANCE OR GUARANTEE SIGN FOR CONTRACT WORK.

offered as a suggestion for the mounting of the sign. The sign itself may be placed under double-thickness glass (size 3 in. x 8 in.) while the frame may be of oak, painted black. This is secured by screws to a base of solid white pine, the latter being attached to the walls by screws and painted white.

The wording of the sign, as suggested, was:

We guarantee until July 1, 1921, all workmanship and material of this heating system as installed by us in accordance with our contract of June 19, 1919.

J H. SMITH & Co.
Contractors.

Dated, July 1, 1920.

How to Obtain a True Sample of Boiler-Feed Water for Laboratory Analysis.

In order to obtain a true sample of boiler-feed water for purposes of analysis by the chemist at the laboratory, it is highly important that in the manner of its taking, certain regulations be closely adhered to.

The water should be taken from a representative part of the body of water in use or to be used, either at an intake pipe or in a stream at a sufficient distance from the bank to avoid stagnant water. If taken from a faucet the water should be run off for a time prior to filling but, if from a body of water, the bottle should be sunk below the surface and after filling and rinsing should be refilled with the sample water, using care that the water filling the bottle does not come into contact with the hands. Since the bottle has been washed at the laboraory it should be rinsed only with the sample water. When the bottle has been filled to within 3 in. of the top, the stopper should be securely inserted and an envelope with the data attached. It may be then placed in its case, properly tagged and shipped by express.

The blank form from the laboratory should be carefully filled out, giving date sampled and source, such as well, creek, lake or reservoir with proper name or owner's name. If taken from a well, it will be necessary to state the kind, depth and diameter; and if deepened by bore holes or otherwise, the dimensions of both parts. Note the distance of the supply from the boiler or if in a city, the distance of the nearest main.

Advise whether the water is unusually high or low from any cause, such as any considerable amount of rain or melting of snow during the previous two weeks, if the water changes in appearance at different seasons or after violent storms and whether the sample presents the usual appearance of the water. The character of the soil and water-bearing stratum should be stated and also if the quantity of water is satisfactory at all seasons. The suction head to the pump should be obtained when running at full speed.

The source of the water is most important, the distances, directions, relative elevations and character of pollution being given for any possible source of pollution, such as coal mines, coal or cinder heaps, factories, slaughter houses, stockyards, stables, sewers, cesspools, privies, foul pastures or refuse dumps of any kind.

Various Methods of Supporting and Protecting Pipes.

The running or installation of pipe lines usually brings up the question of their protection and support. While small pipes may be hung in the usual manner, those of larger size (say 10-in. and above), when adjacent to walls, may be conveniently supported by means of wall brackets as shown in Fig. 1, wrought-iron shapes being used and made adaptable to the varying sizes of pipes and pipe rolls. A table giving the dimensions of parts to support different pipe sizes may be readily

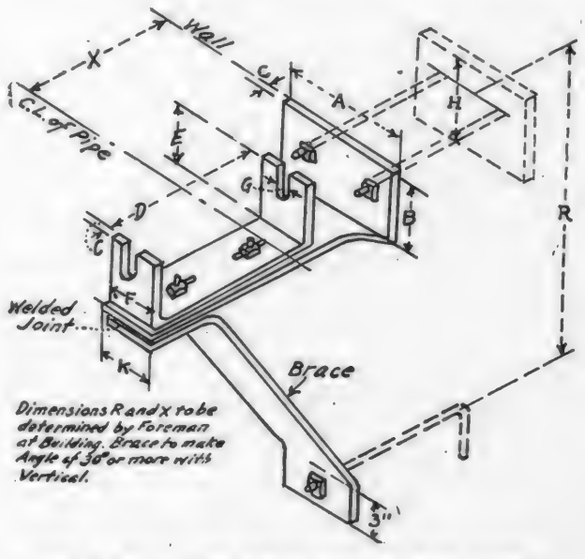


FIG. 1—WALL BRACKET SUPPORT FOR PIPES.

made up for the construction of both this pipe hanger and the one as shown in Fig. 2.

Fig. 2 ordinarily represents a convenient form of adjustable pipe hanger for use in buildings but for overhead runs between buildings something more elaborate is necessary. This

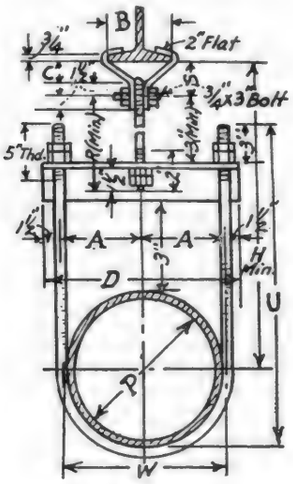


FIG. 2—ADJUSTABLE PIPE HANGER.

is a matter which may be taken care of as shown in Fig. 3, using extra-strong pipe and extra-heavy fittings.

The uprights shown are filled with concrete and anchored to concrete piers. In the top of each upright an eye-bolt is set to which is attached the longitudinal bracing which connects to the next similar set of supports. This bracing is adjusted by means of turnbuckles, as are also the individual pipe hangers. Separate hangers terminating in bolted iron straps facilitate repairs.

Pipe openings at the buildings can be well protected by a series of three plates arranged so as to be readily removable

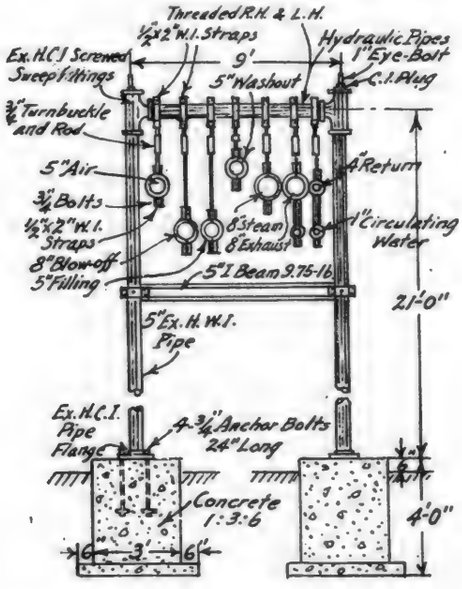


FIG. 3—METHOD OF SUPPORTING OVERHEAD PIPES BETWEEN BUILDINGS.

without interfering with any pipes other than the one to be taken down.

When it comes to piping laid in the floor, Fig. 4 represents a desirable form of trench construction for pipes in concrete floors. The trench may be of masonry or concrete or a com-

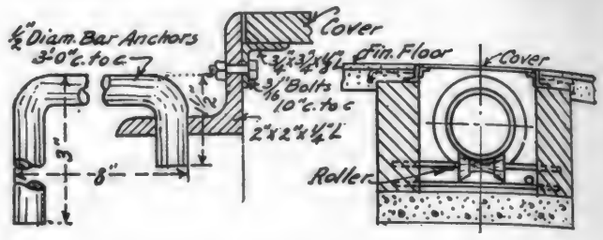


FIG. 4—CONSTRUCTION OF TRENCH FOR PIPES IN FLOORS.

bination of both. The cover plates are well supported and their supports firmly anchored in the concrete.

Piping must often of necessity be laid directly in the concrete floor fill. When this is done, a good method of protection from contact with the cinder fill is shown in Fig. 5, using galvanized-iron No. 16-gauge arches over the pipe. An air space of ½ in. is provided so that the pipes expand or contract independently of the floor construction.

Pipes buried in the earth below floors should be placed inside of salt-glazed terra cotta pipes having tight cemented joints, using pipes of sufficient size to inclose not only the pipe but the fittings.

Lead pipe is sometimes used in certain work but when buried

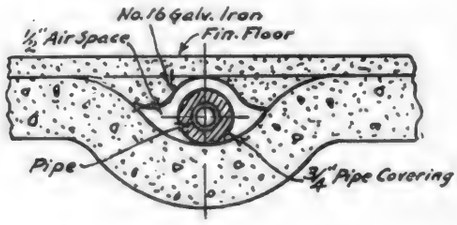


FIG. 5—METHOD OF PROTECTING PIPES IN CONCRETE FLOOR CONSTRUCTION.

in cinders, even this will corrode, though not so rapidly as iron or steel pipe. Sulphuric acid will not attack lead as readily as it does iron or steel but alkaline, chloride and sulphate present in some ashes will perceptibly corrode such pipes.

Dissolved carbonic acid and oxygen, if present in distilled water (such as condensed steam), will also corrode pipes of lead and when these elements are double the amount of dis-

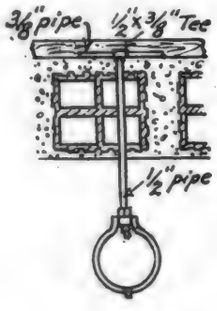


FIG 6—PIPE HANGER SUPPORTED FROM HOLLOW TILE CONSTRUCTION.

solved oxygen, the action is most energetic. If the condensed steam or water is pure and contains neither dissolved carbonic acid or oxygen, the corrosion will be but very little.

It is often a question as to how to support pipes when the building construction is of hollow tile but this may be readily accomplished by means of the pipe hanger shown in Fig. 6.

How to Make Pipe Bushings Out of Standard Pipe.

It is a good thing to know that bushings can be made out of standard pipe. Many pipe fitters don't know that it can be done. Or, if they know that it can be done they don't know the correct size of drill to use for tapping. I have always known that it can be done and have occasionally made bushings out of pipe, but each time I found it necessary to first look into my handbook for the drill size to use and that is so much trouble that it is frequently easier to go to the store and buy a new bushing. Recently, though, it has been very difficult to buy bushings in stores on account of shortage of all pipe fittings, hence I feel that the following information should be of much value. I have collected all of the data together for all bushings that can be made out of ordinary sizes of extra heavy and double extra heavy piping.

To bush from ¼-in. to ⅛-in., for example, get a piece of ¼-in. extra heavy pipe sufficiently long for cutting the outside thread. Then cut the end off to the desired length, drill or ream with a 21/64-in. drill (diameter of drill 0.328 in.) and then tap with a ⅛-in. pipe tap. That's all there is to it.

The table below tells the complete story for all ordinary sizes. Note that in one case, ⅜-in. to ¼-in., the internal diameter of ⅜-in. extra heavy pipe is such that no drilling is necessary. Also note that in bushing from ½-in. to ⅜-in. either extra heavy or double extra heavy piping can be used.

PIPE AND DRILL SIZES.

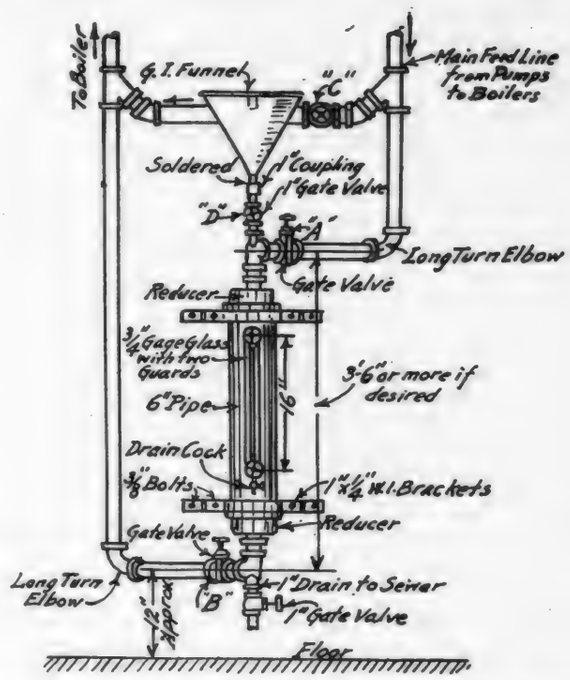
To bush from (Size in inches)	Use this size of pipe (in. dia.)	Use this size drill or reamer (in. dia.)
¼ to ⅛	¼ extra heavy	21/64 drill = 0.328
⅜ to ¼	⅜ extra heavy	None
½ to ⅛	½ double extra heavy	21/64 drill = 0.328
½ to ¼	½ double extra heavy	27/64 drill = 0.422
½ to ⅜	½ double extra heavy	9/16 drill = 0.562
½ to ⅜	½ extra heavy	9/16 drill = 0.562
¾ to ⅜	¾ double extra heavy	9/16 drill = 0.562
¾ to ½	¾ double extra heavy	11/16 drill = 0.688
1 to ¾	1 double extra heavy	29/32 drill = 0.907
1¼ to 1	1¼ double extra heavy	1 1/8 drill = 1.125
1½ to 1	1½ double extra heavy	1 1/8 drill = 1.125
1½ to 1¼	1½ double extra heavy	1 15/32 drill = 1.468
2 to 1½	2 double extra heavy	1 23/32 drill = 1.72
2½ to 2	2½ double extra heavy	2 3/16 drill = 2.187
3 to 2½	3 double extra heavy	2 9/16 drill = 2.562
3½ to 3	3½ double extra heavy	3 3/16 drill = 3.187
4 to 3½	4 double extra heavy	3 11/16 drill = 3.688
4½ to 4	4½ double extra heavy	4 3/16 drill = 4.187

W. F. SCHAPHORST.

A Boiler Compound Injector Made of Pipe Fittings.

The accompanying sketch illustrates a simple method of injecting compounds into boilers by means of an injector made of pipe fittings, which, being installed in the by-pass of the boiler-feed line, may be operated while the boilers are in service. The by-pass should be of the same size as the feed line while the size of the pipe chamber will vary in accordance with the quantity of compound used at one time, two feet of 6-in. pipe being sufficient for most requirements.

The pipe chamber is seecurely bracketed to the wall and equipped with a ¾-in. by 16-in. gauge glass fitted with guards and a drain cock. This chamber, by means of reducers, is connected at the bottom to a valved 1-in. drain to sewer and at the top to a galvanized-iron funnel soldered to a 1-in. coupling. Gate valves, Y fittings and long-turn elbows should be used to reduce the friction to the flow.



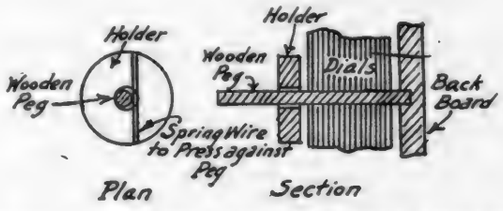
BOILER COMPOUND INJECTOR MADE OF PIPE FITTINGS.

Opening valve C, then closing A and B, cuts out the injector, after which the contents may be drained to the sewer. To fill the pipe chamber with compound, the drain valve must be closed and valve D opened. Injection into the boiler is then made by closing valve D, opening valves A and B and cloisng valve C in the order given.

Convenient Method of Filing Meter Records and Plant Piping Diagrams.

The difficulty in filing circular meter records, particularly in the assorted sizes, may be overcome as shown in the sketch by means of wooden spindles with circular wooden discs and a spring wire to press against each peg. One spindle should be reserved for the records of each meter and large white distinctive lettering should be placed underneath each set of charts so as to indicate clearly and readily the nature of their service.

Good practice in most plants calls for various records, such as charts for recording the temperature of the outside atmosphere, boiler feed water and heating returns, steam pressures of the boiler header, heating supply and returns and city water,

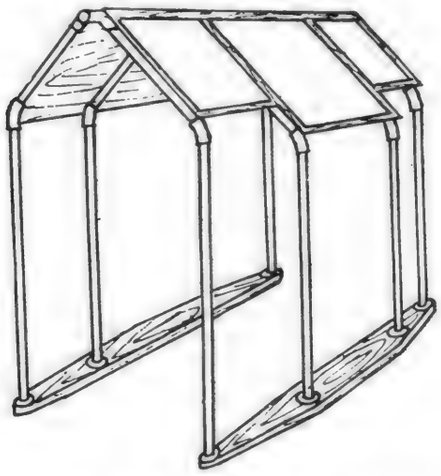


FILING DEVICE FOR CIRCULAR METER RECORDS.

steam flow meter and time records from watchmens' clocks. It is advisable to enclose such records in a convenient wood cabinet with hinged door and lock.

Another problem is the matter of providing permanently for plant piping diagrams which are consulted so frequently that they soon become worn and smeared and are never at hand when wanted or in time are carried away for consultation and never returned.

Such diagrams may be protected from abuse by mounting under glass but if placed on the wall, they are not so convenient as when supported by a pipe frame as shown in the illustration. This pipe frame is movable and built like the frame of the



MOVABLE PIPE FRAME SUPPORT FOR PLANT PIPING DIAGRAM.

usual house while the top is inclined at an angle at the proper height for convenient consultation. Each system of piping, as steam, water, air, etc., is set in its own wood frame under glass (six being shown) and the complete set with its pipe frame is then located in the engine room for ready reference.

LEGAL DECISIONS

Lessor's Obligation to Install Central Heat Where Plant Fails.

A lease of premises required the installation of central heat should the heating plant prove defective, and the parties agreed by a separate agreement that, as the building needed repairs, the lessee might make the repairs and deduct from the rent expenditures up to $1,000. The Michigan Supreme Court holds, Longcor v. Detroit Homeopathic College, 178 N. W. 222, that when the heating plant failed to work the lessor was bound to install central heat, though the lessee had repaired the plant, notwithstanding that the intention of the parties as shown by the writings was more or less hazy.

It was clear that, if there had been no such provision in the lease and no accompanying agreement, the lessor would have been under no obligation to connect the plant with central heat. By the insertion of the provision in the lease the lessor, without doubt, obligated itself to connect the premises with central in the event the boiler failed. The question, therefore, arose whether it was the intention of the subsequent agreement to relieve it from that obligation. It did not appear to the court that it had that effect.

Regulation of Heat Rates by Cities In Iowa.

Following Iowa Railway & Light Co. v. Jones Auto. Co., 182 Iowa 982, where it was held that a heat, gas, etc. franchise, duly approved by the electors, is, at all times, under the control of the city council, in so far as a reasonable upward or downward revision of the rates is concerned, the Iowa Supreme Court holds, Selkirk v. Sioux City Gas & Electric Co., 176 N. W. 301, that under Iowa Code Supp. 1913, § 725, empowering a city to regulate heat and gas rates, a city has the right to pass an ordinance fixing such rates and repealing all ordinances fixing the rates theretofore passed, notwithstanding that an ordinance fixing such rates and providing that upon acceptance thereof by the corporation it should become a binding contract between the city and the company was in force at the time the former ordinance was passed.

Evidence In Action for Breach of Contract to Install Heating Plant Showing No Damage.

A complaint alleged that prior to 1913 plaintiff and defendants entered into a contract whereby defendants agreed to install a heating plant in plaintiff's dwelling that would heat it properly, for which the plaintiff agreed to pay $520, part payments to be made during the progress of the work, and the balance within 30 days after the completion thereof; that defendant installed the plant, but had never completed the job, and that it was so improperly done that part of the house had been rendered untenantable; that on September 17, 1913, when plaintiff paid $100 on the contract, defendants agreed to complete it, but had never done so; that plaintiff had paid in all $337.25 upon the contract; and that the amount expended to complete it was $200. It was clear that the recovery on these allegations would be limited to $17.25. The general damages claimed on acount of the untenantableness of part of the house were too imperfectly alleged and too remote, and the evidence bearing thereon was excluded. Plaintiff admitted on the stand that the only trouble he had had with the heating of the house was in the kitchen and two bedrooms, where the radiation was insufficient, and he testified that all of defendants' promises to complete the contract related to installing larger radiators in these three rooms. The trial court dismissed the case. On appeal this was affirmed by the Supreme Court of Minnesota, Loe v. Bjorkman Bros., 178 N. W. 316. The court said that, conceding the admissibility of the testimony of a witness as a basis for the jury to find the cost of adding the needed radiation in the three rooms (the witness having testified that he knew the cost in 1918 to be between $100 and $125, and "guessed" that it was nearly the same in 1910, the time when the contract was made and the plant installed), it was entirely plain that the trial court was right in dismissing the case when plaintiff rested, for this testimony—and there was no other on the subject of damages—showed that by expending not to exceed $125, in addition to the $337.25 paid, plaintiff would get a heating plant such as bargained for at a cost of only $462.25, instead of $520, the contract price, so that he was not damaged on his own showing.

Necessity or Nonnecessity for Tests of Apparatus Sold.

In an action for the purchase price of an oil seal combustion control device, which, the seller stated, would save not less than 7% of the cost of fuel used, the New Jersey Court of Errors and Appeals holds, Vapor Vacuum Heating Co. v. Kaltenbach & Stephens, 111 Atl., 171, that it was proper for the Trial Court to refuse to charge the jury that, if the seller refused to make a test to determine whether the apparatus effected a saving of 7%, in the cost of fuel, the verdict must be for the defendant. The failure to make a test might make it difficult for the plaintiff to prove complete performance

and might throw discredit on its claim to recover, but that was unimportant in view of testimony as to acceptance, on which the plaintiff had a right to depend, as it did successfully, and the further fact that the contract did not require tests unless a comparison of evaporative tests were found necessary. The defendant nowhere alleged that necessity, nor did it unconditionally and unequivocally demand any test. There were negotiations on the subject chiefly as to how the expense was to be met, but that was all. Judgment for the plaintiff was affirmed.

CORRESPONDENCE

Tests on Automatic Ventilators.

EDITOR, HEATING AND VENTILATING MAGAZINE:

We are much interested in the tests on automatic ventilators outlined in THE HEATING AND VENTILATING MAGAZINE for October. Upon careful study of the testing apparatus, we think the test was hardly a fair one.

You will appreciate the fact that the fan, being in the end of the wind tunnel and exhausting air from the wind tunnel, will create a pressure within the wind tunnel slightly lower than the atmospheric. This would cause air to rush in from the open end of the tunnel and also through the opening in which the ventilator was mounted. Further, the larger the ventilator mounted on this ventilator pipe, the greater would be the displacement within the wind tunnel. This would shut off the flow of air from the open end of the tunnel and cause a greater flow through the ventilator. You will agree with us, we believe, that this would not be precisely the same conditions as would be met by the ventilators if they were installed in the usual manner upon a roof with the wind blowing across.

We would like to see this matter discussed some time in your publication.

B. U. S.

Kalamazoo, Mich.

AMERICAN SOCIETY OF HEATING AND VENTILATING ENGINEERS

Plans for Annual Meeting.

Plans are going forward rapidly for holding the annual meeting of the American Society of Heating and Ventilating Engineers in Philadelphia, January 26-28, 1921, following a preliminary business meeting in New York on January 25. Former President John F. Hale has been appointed by the Eastern Pennsylvania Chapter as chairman of the chapter's general committee which will have charge of the entertainment features of the meeting.

Headquarters will be at the Bellevue-Stratford.

Nominations for 1921.

Nominations for officers of the American Society of Heating and Ventilating Engineers, to serve during 1921, have been made as follows:

For president, Champlain L. Riley, New York; for first vice-president, Jay R. McColl, Detroit; for second vice-president, H. P. Gant, Philadelphia; for treasurer, Homer Addams, New York. For members of the council: Joseph A. Cutler, Chicago; Samuel E. Dibble, Pittsburgh; William H. Driscoll, New York; Edwin S. Hallett, St. Louis; E. Vernon Hill, Chicago; Alfred S. Kellogg, Boston; E. E. McNair, Detroit; and Perry West, New York.

For members of the society's Committee on Research, which is in charge of the Bureau of Research in Pittsburgh, the following have been nominated to succeed themselves for a term of three years: Homer Addams, E. Vernon Hill, A. S. Kellogg, J. R. McColl and F. R. Still.

New York Chapter Gets Data on Chimneys.

With such a subject to discuss as "Chimneys—Their Theoretical Design, Construction and Troubles," and with an array of five important speakers, the November meeting of the New York Chapter of heating engineers attracted an unusually large attendance. Walter S. Timmis was in direct charge of the meeting which was held at the Building Trades Club, November 16.

Before turning over the meeting to Mr. Timmis, President W. L. Fleisher expressed the sense of loss felt by the chapter, as well as by the society itself, in the death of Director John R. Allen of the society's Bureau of Research. Mr. Timmis, who then assumed the chair, presented Ira N. Woolson, consulting engineer for the National Board of Fire Underwriters, who talked about the proposed "Ordinance for Construction of Chimneys" which the board is compiling. The necessity for such an ordinance, said Mr. Woolson, is great, due to the large number of chimney fires. The annual property loss due to defective flues he placed at $12,000,000, and this figure should be increased from 25% to 30% to cover the large number of properties not insured and from which, therefore, no figures are available. Of the fires caused by defective flues, 66% are in dwellings while a large percentage of the 15,000 lives lost each year in fires occurs in dwellings.

He said the proposed ordinance had received the enthusiastic endorsement of numerous bodies interested and their suggestions for revisions and changes are now being made. When completed the draft will be submitted to the various engineering and other bodies for adoption or approval.

The next speaker, Walter E. Goldsworthy, manager of sales for the Dover Boiler Works, discussed steel smokestacks. Many people, he said, consider a steel stack as so much steel pipe stood on end. Its design and construction, however, are far from being so simple a proposition. He divided such stacks into self-supporting types, guyed stacks and stacks for office buildings, interior and exterior. The speaker criticised the common practice of building a guyed steel stack of heavier plates at the bottom than at the top and also of having the sections telescope into those above. As he expressed it, a stack built in this manner should be turned upside down and it would then be a good stack. In proof of this he cited the fact that stacks corrode more rapidly at the top than at the bottom, due to the formation of sulphuric acid at that point, while, with the sections telescoping into those above, a shelf is formed in each section where the moisture can collect and eventually corrode the stack.

In the case of interior office building stacks, he said care should be taken to allow for expansion and contraction. He offered as a simple expansion rule: "Expansion equals ¾ in. per 100 ft. per 100° F. change in temperature."

Mr. Goldsworthy said that the idea of guying the tops of steel stacks when they are carried a short distance of,

say, 30 ft. above the roof was ludicrous if one would stop to consider the comparatively small stresses to which the stack is subjected. For exterior stacks the thickness of the metal should be not less than ¼-in., running up to ⅜-in. Exposed steel stacks should be painted at least every two years and he suggested a rule of once a year to insure their being painted every other year, at any rate. In the matter of cost, the round stack is the cheapest, oval stacks coming next and rectangular stacks the most expensive.

William H. Leggo, of the M. W. Kellogg Company, followed with an illustrated talk on "Hollow Brick Chimneys." Mr. Leggo told first of the development of the modern chimney. Views were then presented of radial brick chimneys in course of construction showing in detail the methods followed. Many interesting points were brought up, such as the improved method of building chimneys from the inside, the necessity of having the fire-brick linings free to move up and down, especially when high stack temperatures are necessary, and the undue importance attached to tight clean-out doors. These doors do not need to be absolutely tight, he said, and when so made there is danger of their being kept closed when they should be opened to permit of cleaning out the accumulated soot.

P. J. Daugherty, engineer for the International Heater Company, had as his subject "Chimney Troubles," which he discussed under the topics of air leakage, obstructions, lack of height, lack of efficient area, excess of heat loss, down draft in the chimney, effect of ventilators in boiler rooms, and effect of cellar door or window openings into boiler rooms, especially on the lee sides of buildings. A common trouble, he said, was to find two boilers connected to the same flue. When this happens there is nothing to do but to cut out the check and operate the boilers by the dampers only. He said the tile-to-tile construction, while good practice in itself, is a cause of great loss, due to poor construction. In the old days, he said, chimneys were better built, but when the tile-to-tile construction came in, the brick layers attached less importance to the brick part of the work, with the result that the bricks were laid with less care.

Mr. Daugherty related many incidents showing the troubles encountered by the chimney man, most of which, however, could be traced to air leaks into the chimney, due sometimes to a cracked elbow joint and very frequently to the practice of the bricklayer in "buttering" the edge of his brick with mortar as was proven by the fact that chimney leaks are seldom along the horizontal seams, but usually along the perpendicular seams. He gave 35 ft. as the minimum height for a chimney. He decried the idea of a tight ash-pit and said there should be some leakage of air into the ash-pit.

The final speaker, William H. Driscoll, spoke interestingly of the stacks installed in the Equitable and Woolworth Buildings in New York, as well as in the Central-Union Trust Building, in Cincinnati. He told of the considerations that led to the design of a 14-ft. stack for the Equitable Building, the controlling argument being the effect of skin friction for the unusual height of over 600 ft. When the plant was first placed in operation and only a part of the capacity utilized, he had shut off half of the flue opening by dampers. Later, when the plant was operated at full capacity, he visited the building and found that these dampers were still closed, indicating that the flue could have been made of smaller diameter with satisfactory results.

The full program for the balance of the season was announced as follows:

December 13—The Vehicular Tunnel—Its Ventilating and Engineering Problems. Champlain L. Riley in charge.

January 24—The Young Engineer—His Practical Problems. A. S. Armagnac in charge.

February 14—Fuel Session—A Review and Development of the Past Year. David Moffatt Myers in charge.

March 21—Air Conditioning—Its Apparatus and Application (At the laboratary of the Carrier Engineering Corporation, Newark). J. I. Lyle in charge.

April 18—The Needs of Marine Ventilation and the Present Lack of Same in our Merchant Marine. F. R. Still in charge.

May 16—Annual dinner and presentation of the prize inter-chapter paper of the year.

Michigan Chapter Pays Tribute to Director Allen.

The fact that Director John R. Allen, of the society's Research Bureau, was to have been the principal speaker at the November meeting of the Michigan Chapter, lent a note of sadness to the meetng which was held at the Dixie Land Inn, November 8, less than two weeks after Dr. Allen's death. He was the first president of the Michigan Chapter.

J. R. McColl spoke feelingly of the life and work of Dr. Allen. Mr. McColl was exceptionally well qualified to do this because Dr. Allen many years ago founded the engineering firm of which Mr. McColl is now the senior member.

Following Mr. McColl's talk, the chapter appointed a committee to prepare a suitable resolution to become part of its permanent records.

The members then listened to a talk on boilers by J. F. McIntire which led to a long and interesting discussion.

The December meeting was scheduled to be held in Toledo, O., December 13.

Kansas City Chapter Hears Talk on "Air Conditioning."

A talk on "Air Conditioning" by Dr. E. Vernon Hill, president of the American Society of Heating and Ventilating Engineers, was the feature of the November meeting of the Kansas City Chapter. H. E. Barth was the chairman for the evening. At the preliminary business meeting the death of Professor John R. Allen was referred to feelingly.

In introducing his subject, Dr. Hill called attention to the fact that air conditioning means more than ventilation and suggested that another term, "aerology," be used, whose significance would include the factors not now included in the term "ventilation." He defined aerology as the science of producing a maintaining air in the best physiological and economic condition.

He explained the necessity of consideration of humidity, air motion and temperature in determining comfortable and healthful conditions, commenting on the fact that the carbon dioxide content is now disregarded as the main factor in air conditioning. By means of slides, showing instruments, charts and test methods, he explained the synthetic air chart, which has been adopted by the Society for the determination of ventilating standards. Dr. Hill showed the instruments for the determination of the various items and explained the methods used. He also showed the chart for determining comfortable conditions with temperature, humidity and air motion as the factors.

Dr. Bullock, health commissioner of Kansas City, was then introduced and told in an emphatic way of the necessity for large appropriations for public health work in Kansas City and asked the support of the local chapter in his efforts. The Legislative Committee will soon meet with Dr. Bullock to further this movement. Dr. E. J. Rock, W. W. Rose and R. W. Stookey also made short talks.

The chapter has arranged the following program for the winter and spring meetings:

December 3, 1920: "Regulation of Heating and Ventilation by State Law and the Proper Method of Publicity in Connection With Same, as Applied to Public Buildings." W. M. McIntyre, chairman.

January 7, 1921: "An Established Formula for Estimating Radiation in Average Apartment, Etc. Heating Systems." B. F. Cook, chairman.

February 4, 1921: "Better Service—Increased Profits, Mutually Beneficial, and General Benefits of Association Work." V. H. Parks, chairman.

March 4, 1921: "Oil Burning Devices for Residences, and Oil vs. Coal as Fuel for Heating Purposes." W. W. Howe, chairman.

April 1, 1921: "Study to Be Given in Planning Modern Equipment at a Minimum Cost." R. L. Dunlap, chairman.

May 6, 1921: Subject to be determined.

Illinois Chapter Takes Up "Fuel Oil and Fuel Oil Burners."

Fuel oil came in for a lengthy discussion at the well-attended November meeting of the Illinois Chapter, held November 8 at the Chicago Engineers' Club; there were approximately 80 present for dinner.

The speakers included G. de C. May, heating engineer for the Steam Corporation, Chicago, manufacturer of the Nokol burner; and F. R. Crane, Jr., of the Crane Oil Burner Co., Chicago, both of whom spoke on fuel-oil burners. C. L. Knopf, staff engineer for the Sinclair Refining Company, covered the subject of fuel-oil itself in a lecture illustrated by lantern slides. J. E. Chubb was chairman for the evening.

One of the interesting features of the meeting was a description of the trip across the Atlantic in the NC-4, which, it will be recalled, was the first to accomplish this feat. This talk was given by James L. Breese, who was a member of the crew in the capacity of chief engineer, and who also had charge of powering the ship before making the flight. He said that the NC-4 practically never swerved from its course. It made the trip from Newfoundland to the Azores in a little more than 15 hrs. and the gas consumption was figured down to such a fine point that on landing at the Azores, there was gas enough for 35 min. of flying time.

At the preliminary business session, President J. C. Hornung spoke of the untimely death of Director Allen and appointed a committee consisting of Messrs. Hill, Hart and Lewis, to prepare resolutions of condolence.

Other meetings for the season are scheduled as follows:

December 13, 1920. "Ventilating of Large Auditoriums." This will be conducted by Mr. Yardley, engineer, associated with local architects.

January 10, 1921. "The Work of the Bureau of Research," at which Prof. Hoffman and Prof. Willard will be present.

February 14, 1921. "Hot Water Versus Steam for Heating." This meeting will be in the nature of a debate and a lively discussion is anticipated.

March 14, 1921. "Refrigeration and Its Application to Heating and Ventilating."

April 11, 1921. "Is Exhaust Steam More Efficient than Live Steam for Low Pressure Heating Systems?" This meeting will also be a debate.

May, 9, 1921. May meeting. In accordance with established custom, the May meeting will be a social affair. The chairman will be John Boylston.

The Illinois Chapter is making a drive for new members, those announced at the November meeting being H. W. Hand, S. C. Bloom, Harry N. Dix, Jr., H. W. Skinner, and A. M. K. Arnberg (associate).

The chapter's Research Bureau Committee is conducting an active campaign for increased subscriptions to the Research Bureau, with good results.

Western New York Chapter Holds Record Meeting.

One hundred members and guests attended the November meeting of the Western New York Chapter which was held at the Hotel Iroquois, Buffalo, November 1. Although this was the night before Election Day, the attendance was the largest in the history of the chapter. A varied program was offered, the speakers including W. A. Rowe, of the American Blower Co.; Archer A. Landon, of the American Radiator Company; and H. D. Eldridge, of the Reading Iron Company.

Mr. Rowe gave a description of the fan industry and of the work that the American Blower Company is doing from day to day in the establishment of better conditions in the heating and ventilating apparatus manufactured by them.

Mr. Landon gave a delightful chat under the heading "Timely Topics." His talk was serious at times concerning things of interest to the heating engineer's society and its members. He also spoke of foreign conditions and national conditions of interest to all. It is the chapter's idea to have at each session one speaker on non-technical matters, and Mr. Landon in this case was the one selected.

Mr. Eldridge's address embraced an interesting description of the Reading Iron Company's progress in the manufacture of pipe. His talk was illustrated by moving pictures, and of all the moving pictures that the chapter has enjoyed at different sessions, it was the general opinion that the Reading Iron Company did themselves proud in the pictures they gave and in the descriptive talk by their assistant advertising man.

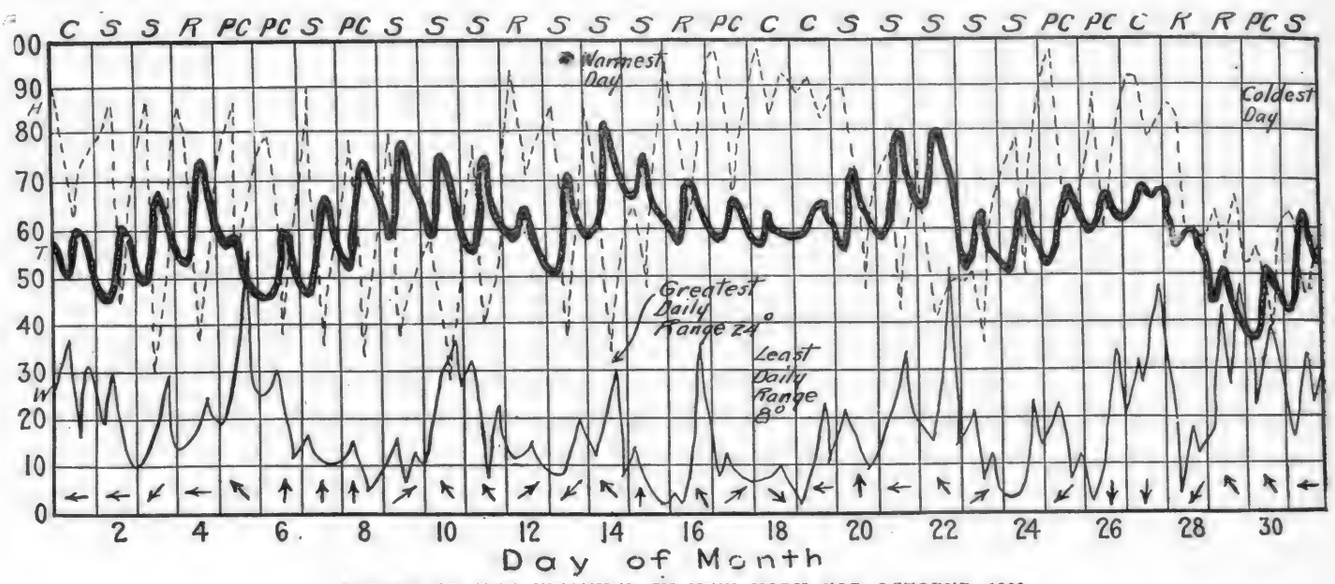
Before the meeting adjourned, President Coe appointed C. W. Farrar and C. A. Booth to send an appropriate letter to the family of John R. Allen, expressing the deep sympathy of this chapter in his death. Mr. Coe also spoke of the loss the society had suffered in the untimely death of Professor Allen, and hoped that the important work of the Research Bureau would be carried on, as started by Mr. Allen.

Corrosion of Steel Stacks.

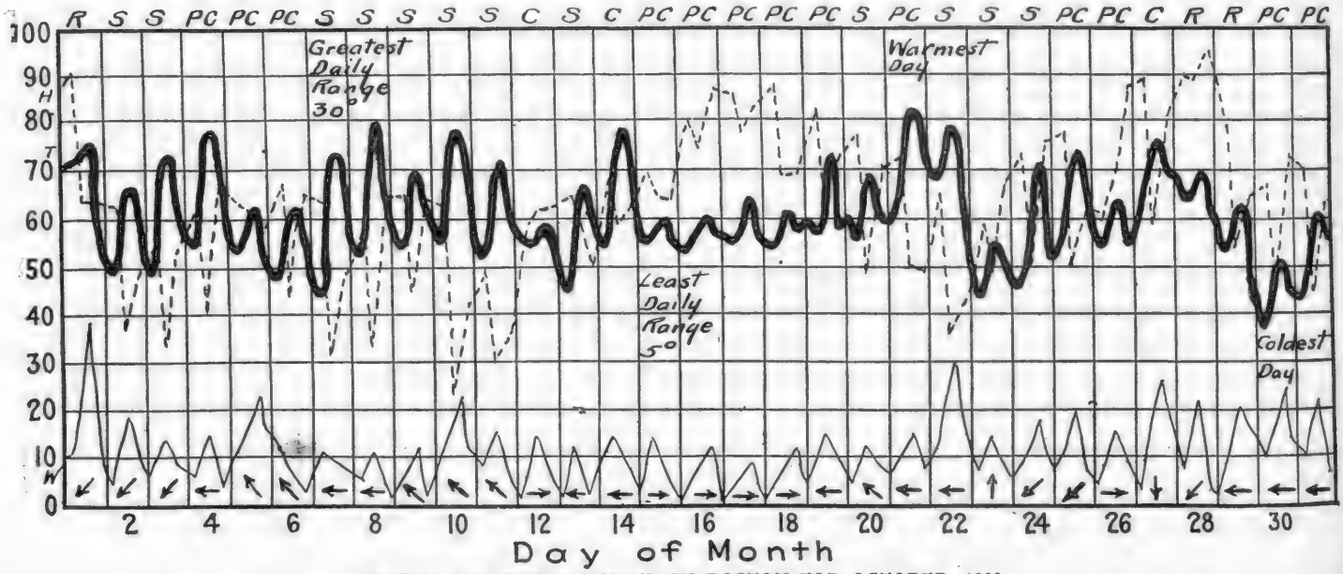
Steel stacks corrode more rapidly at the top than elsewhere because of the sulphuric acid arising from particles of soot and rain in combination. A copper cap or hood of heavy construction affords some means of protection but the life of steel stacks even ¼ in. thick is brief under certain conditions. Difficulties in this respect are the greatest where steam jets are used to increase the draft or where steam is injected into the furnace to prevent formations of clinkers.

THE WEATHER FOR OCTOBER, 1920

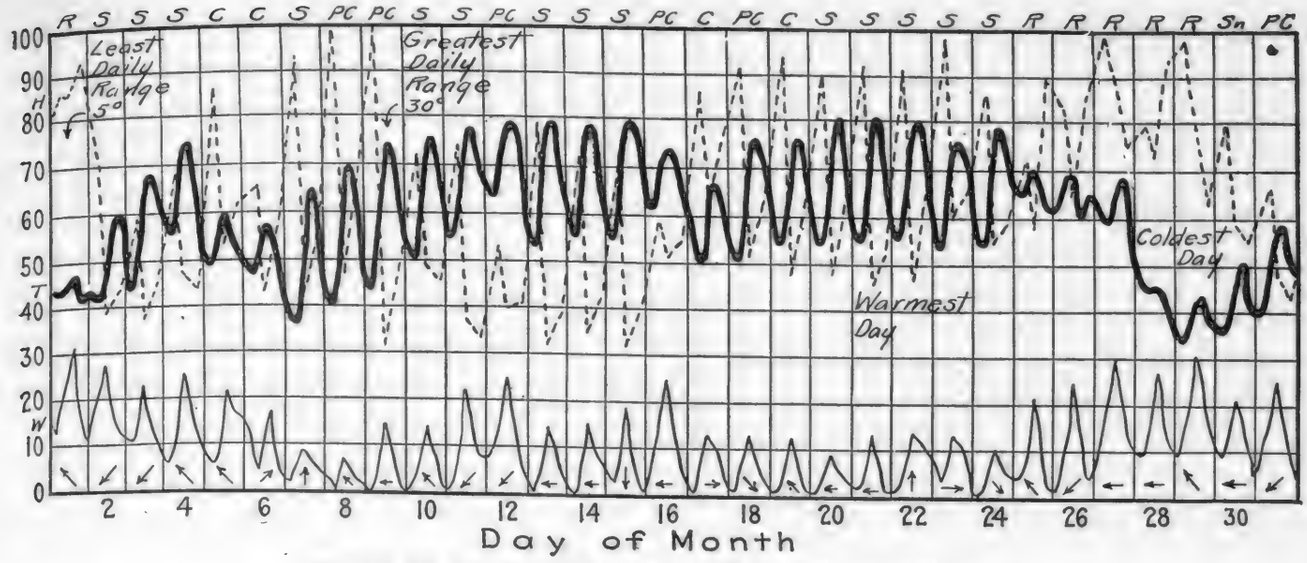
	New York	Boston	Pittsburgh	Chicago	St. Louis
Highest temperature, degrees F.	82	82	81	82	85
Date of highest temperature	14	21	21	10	10
Lowest temperature, degrees F.	37	37	34	31	35
Date of lowest temperature	30	30	29	29	29
Greatest daily range, degrees F.	24	30	30	27	28
Date of greatest daily range	14	7	9	2	10
Least daily range, degrees F.	8	5	5	5	5
Date of least daily range	18	15	1	25	24
Mean temp. for month, degrees F.	60.4	59.8	59.6	61.9	64.0
Normal mean temp. for month, deg. F.	55.6	52.3	54.9	53.2	58.4
Total rainfall, in.	0.77	1.64	1.48	1.57	2.36
Total snowfall, in.	0	0	Trace	0.2	Trace
Normal precipitation, this month, in.	3.71	3.86	2.36	2.55	2.41
Total wind movement, miles	11086	6593	6510	8219	9693
Average hourly wind velocity, miles	14.9	8.1	8.8	11.0	13.0
Prevailing direction of wind	N. W.	W.	S. W.	S. W.	S.
Number of clear days	15	12	14	19	17
Number of partly cloudy days	9	15	6	5	9
Number of cloudy days	7	4	11	7	5
Number of days on which rain fell	6	3	7	10	12
Number of days on which snow fell	0	0	2	1	1
Snow on ground at end of month, in.	None	None	None	None	None



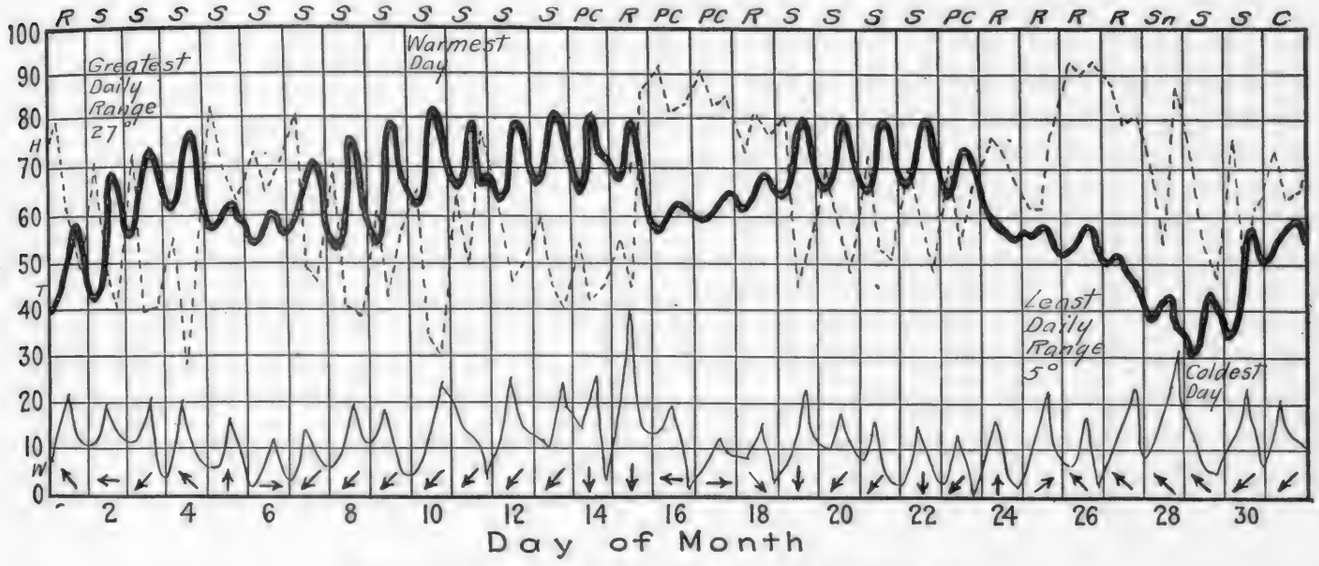
RECORD OF THE WEATHER IN NEW YORK FOR OCTOBER, 1920.
(Hourly Observations of Relative Humidity Plotted on this Chart.)



RECORD OF THE WEATHER IN BOSTON FOR OCTOBER, 1920.


R S S S C C S PC PC S S PC S S S PC C PC C S S S S S R R R R R Sn PC
Least Daily Range 5°
Greatest Daily Range 30°
Coldest Day
Warmest Day
H
T
W
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN PITTSBURGH FOR OCTOBER, 1920.


R S S S S S S S S S S S PC R PC PC R S S S S PC R R R R Sn S S C
Greatest Daily Range 27°
Warmest Day
Least Daily Range 5°
Coldest Day
H
T
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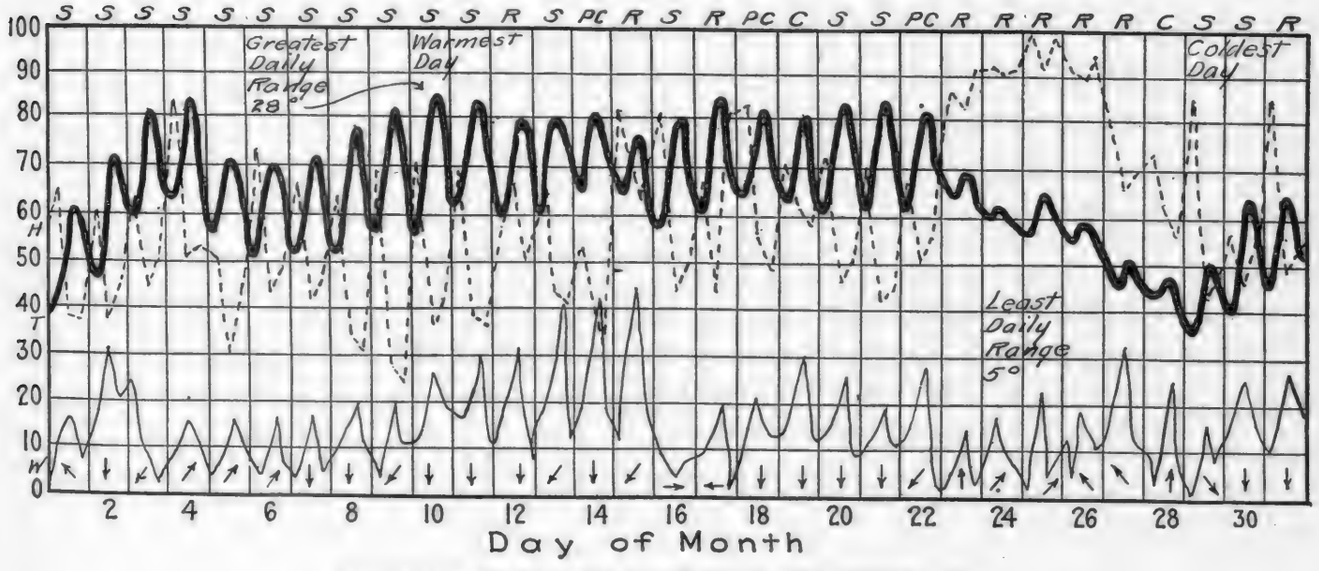
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN CHICAGO FOR OCTOBER, 1920.


S S S S S S S S S S R S PC R S R PC C S S PC R R R R R C S S R
Greatest Daily Range 28°
Warmest Day
Coldest Day
Least Daily Range 5°
H
T
W
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30
Day of Month

RECORD OF THE WEATHER IN ST. LOUIS FOR OCTOBER, 1920.

Plotted from records especially compiled for THE HEATING AND VENTILATING MAGAZINE, by the United States Weather Bureau.
Heavy lines indicate temperature in degrees F.
Light lines indicate wind in miles per hour.
Broken lines indicate humidity in percentage from readings taken at 8 A. M., 12 M., and 8 P. M.
S—clear, P C—partly cloudy, C—cloudy, R—rain, Sn—snow.
Arrows fly with prevailing direction of wind.

Annual Meeting of American Society of Mechanical Engineers.

Notable papers on research were among those presented at the recent annual meeting of the American Society of Mechanical Engineers, in New York, December 7-10. They included a paper on "Steam Formulas," by Professor R. C. H. Heck of Rutgers College, who has just compared carefully the various steam formulas in common use. The Power Test Code Committee expects that the discussion brought out by this paper will afford basis for the development of a standard steam table for the use of the Power Test Code Committee.

The results of an extended research in the plant of the Detroit Edison Company by A. E. White, professor of Chemical Engineering, University of Michigan, were presented at a Research Session. Professor White has analyzed the failures of boiler tubes and was able to present authoritative data as to the causes.

Is his paper on the "Effect of Fittings on the Flow of Fluids through Pipe Lines," D. E. Foster of Tulsa, Okla., presented data showing the friction effect of standard fittings in conduits carrying liquids or gasses. Mr. Foster's information was of considerable value to the engineer engaged in laying out pipe lines in the oil fields as well as in general power plant work.

The series of tests made at the Engineering Experiment Station of the Kansas State Agricultural College was presented by Messrs. Potter, Calderwood, Mack and Hobbs. The tests covered the heat insulating value of cork and lith board and showed that lith board has a conductivity approximately 5% greater than cork board. The tests are noteworthy for the low temperatures used and method of calculating results.

W. L. DeBaufre, present head of the Mechanical Engineering Department of the University of Nebraska, was at one time engaged in research at the Naval Experiment Station, Annapolis. While at the Experiment Station he directed a long series of tests upon air pumps and condensers, during which it was desired to measure quantities of air by means of nozzles. This led to a separate investigation which was reported in a paper on this subject.

At a fuel session, held on the opening day, December 7, papers were presented as follows:

Fuel Supply of the World, L. P. Breckenridge.

Low-Temperature Distillation of Coal, O. P. Hood.

Fuel Conservation: The Need for a Definite Policy and Its Requirements, D. M. Myers.

Form Value of Energy in Relation to Its Production. Transportation and Application, Chester G. Gilbert and Joseph E. Pogue.

The newly-elected officers of the society are: President, Edwin S. Carman, Cleveland, O.; vice-presidents, John L. Harrington, Kansas City, Leon P. Alford, New York and Robert B. Wolf, New York; managers: Henry M. Norris, Cincinnati, O., Carl C. Thomas, Los Angeles, Cal., and Louis C. Nordmyer, St. Louis, Mo.; treasurer, William H. Wiley, New York.

Modern Developments in Boiler Practice.

An article by R. E. Butler in a recent issue of the *Ohio Electric Light Association Monthly* gives interesting summary of several important modern developments in power boiler practice induced by changed conditions of fuel and labor supply and cost. According to Mr. Butler, the high price of fuel all over the country is a condition which is more likely to persist, or even to become more acute, than to decline, and has forced increased attention to fuel economy and away from former high ratings which were attained at the expense of reduced efficiency.

One method of increasing boiler capacity, of course, is to prevent the formation of scale and deposit inside the tubes and the only positive means to accomplish this is by the use of condensed steam for the boiler feed. In some cases even the small percentage of make-up water required is supplied by the condensation from evaporators. Boilers using raw or treated water may operate satisfactorily up to a certain rating, but always give trouble when this rating is exceeded.

Another method which is being generally adopted in order to attain higher capacities and efficiencies is to increase the size of the combustion chamber over former standard practice and locate the heating surface as far as possible from the fuel bed. This permits the combustion process to reach a more complete stage before the flame reaches the heating surface, and so reduces the deposit on the first rows of tubes, due to the sudden drop in gas temperature. With some grades of coal and short fire-travel from fuel bed to heating surface, there is likely to be formed on the outer tubes a slag deposit that reduces heat transfer efficiency and may also materially choke down the draft. Even under the best conditions, temperature drop at the heating surface is bound to cause soot deposit on the outside of the tubes and the removal of this dust by mechanical soot blowers is recognized as essential to efficient operation of large boilers. Another argument for the bigger combustion chamber and longer fire-travel between grate and heating surface is the reduction in direct loss through exhaust of gases prior to complete combustion.

PROGRESS IN THE USE OF MECHANICAL STOKERS.

Third in the count of modern advances in operating efficiency of power boilers is the very general adoption of mechanical stokers, particularly of the under-feed type, on boilers of the larger sizes. Numerous advantages of the mechanical stoker are mentioned, among them reduction of labor, increase in uniformity and regularity of charge, and with the under-feed stoker there is eliminated also the need for draft to pull the air for combustion through the fuel bed. In connection with improvement in draft conditions under high ratings, it is frequently found economical to install induced draft fans rather than build stacks of sufficient height to give the required draft. The lower exhaust temperatures incidental to more complete combustion in the furnace, to better heat transfer conditions, and to the growing use of economizers, form another factor favoring the use of induced draft fans.

WHY LARGER BOILER UNITS GIVE MORE EFFICIENT OPERATION.

In general, present day practice in power plants shows a decided tendency toward concentration of boiler equipment into larger units, since these are capable of more efficient operation. The large boiler lends itself more readily to mechanical stoking and the induced draft fan and where one large unit replaces several smaller boilers there is a big immediate gain due to reduction in the number of auxiliary units and necessary meters, gauges, and recording instruments, as well as in cost of labor and supervision. Also in a large boiler, trouble—particularly the major defect of excessive air leakage into the combustion chamber—is concentrated and easier to combat.

PROVISION NOW BEING MADE FOR HIGH-CLASS SUPERVISION.

Not the least important phase of modern efforts toward more efficient boiler operation is the increasing stress laid upon the need for high-class supervision, and the operating conditions are being made such as to permit of this and require it. Reduction of the number of

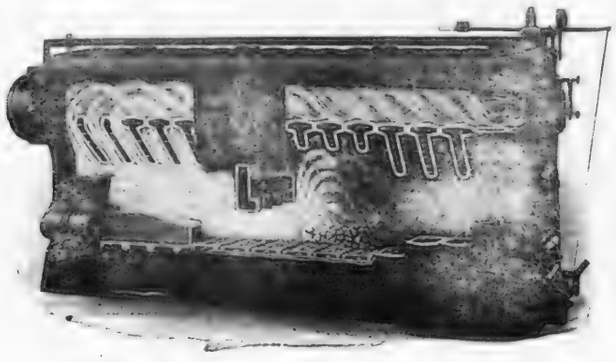
boilers materially decreases the burden of routine on the engineer and enables him to give more careful attention to the fine points of equipment and operating methods. Mechanical means for coal and ash handling reduce the number of men to be supervised and permit closer attention to records. These are kept more accurate by frequent inspection and testing of instruments and consequently yield more valuable information on operating results.

Finally, the very general tendency toward the use of superheated steam has been responsible for some slight increase in boiler efficiencies.

PRESENT STATE OF THE ART IN SMOKELESS BOILER CONSTRUCTION

9.—Imperial Super-Smokeless Boiler.

Of the single-grate built-up cast-iron sectional type, the Imperial super-smokeless boiler is distinguished from others of its general class by the means employed to introduce a supplementary air supply as an aid to more complete combustion of both the carbon and the volatile gas contents of the fuel. The accompanying illustration is almost self-explanatory.



IMPERIAL SUPER-SMOKELESS BOILER.

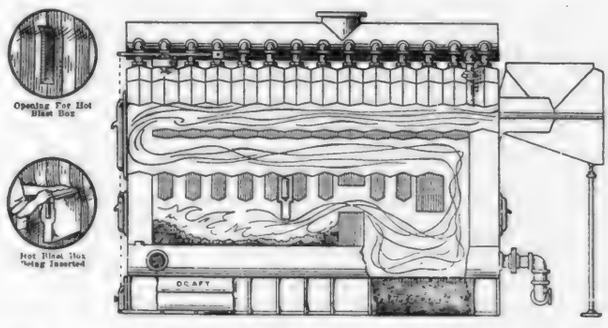
The fuel compartment over a cast-iron sectional shaking grate extends over half the length of the boiler, providing space for an ample charge of fuel which may be low grade and still give first class results. This fire-box is separated from the combustion chamber at the rear by a water-curtain section which extends more than half way down to the grate, producing at the rear of the fire-box a marked contraction in cross-section of the gas circulation path. The increase in velocity at this point due to decrease in section, causes a suction tendency which is utilized to introduce here the additional air supply needed for complete combustion. On both sides of the water curtain section there are air inlets with regulating dampers and from these inlets the air enters a hot blast chamber where it is heated to a high temperature before passing down into the "throat" beneath. The result of this air entry is to produce at the contraction the intense heat necessary for complete combustion.

The path of flow of heated gases is unusually long in this boiler so that there is plenty of time for the combustion process to be completed as well as for transfer of heat from these gases to the water in the boiler. The Utica Heater Company, Utica, N. Y., makers of the Imperial boiler present conclusive evidence of its smokeless operation under a wide range of working conditions. They claim also that the flue gas analysis for this boiler shows practical absence of carbon monoxide content.

10.—Prox Duplex Economic Smokeless Boiler

In the Prox Duplex Economic heavy-duty and extra heavy duty, single grate, up-draft smokeless boiler, the most notable feature is the smokeless or hot blast device. This is inserted in the side of the boiler, at the point shown in the illustration. It is made in two sections and can be replaced without pulling the fire. It is also possible with this boiler to remove and replace each section without molesting the other sections in the boiler. When a section has to be replaced, that section can be cut out and left in place until the repair section arrives, by plugging the 2-in. header openings, one in the top header and one in the side.

Referring again to the hot blast box in the side of the boiler, it should be noted that this box is 37 in. long and in order to install same a space of at least 40 in. should be allowed on each side of the boiler. In addition to admitting cold air to the fire it is cooled by air drawn in through the upper chamber which helps to preserve its life. The manufacturers are the Frank Prox Co., Terre Haute. Ind.



PROX DUPLEX ECONOMIC HEAVY DUTY AND EXTRA HEAVY DUTY, SINGLE GRATE, UP-DRAFT SMOKELESS BOILER.

11.—Monarch Down-Draft Smokeless Boiler.

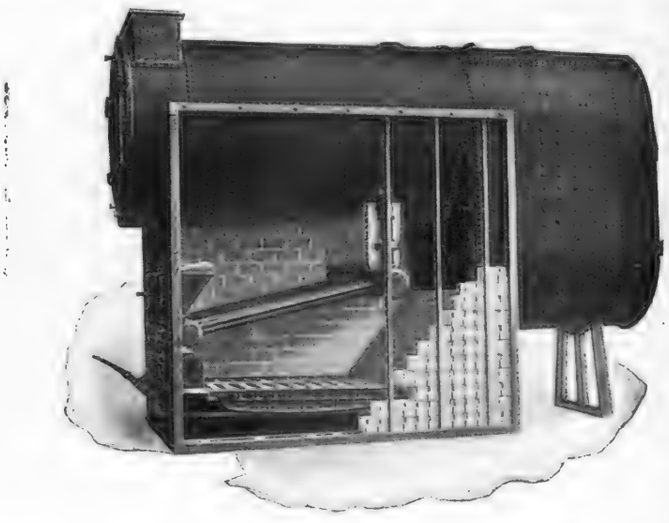
In the Monarch smokeless boiler, manufactured by the William H. Page Boiler Co., Meadville, Pa., the down-draft, double-grate principle is combined with the built-up section type of construction. The upper grate is cast integral with the boiler section, each bar being hollow the same as the boiler section of which it is a part. The inside area is ample for free circulation and every part is backed by water so that it cannot burn out. The spaces between grate units are proportioned with a view to providing passage for a sufficient supply of air to give complete combustion. In common with other boilers having the water-tube grate, this is counted as an important part of the heating surface. The last section of the upper grate is made of bridge-wall form, providing a back to the upper fuel compartment.

The upper heating surfaces of the Monarch boiler are so arranged as to form three passages for travel of the heated gases. Circulation of these gases is from the fuel chamber down through the upper grate and from the ash-pit up through the lower grate into the fire-box, from which the jointed streams pass backward and upward behind the bridge-wall section. Here they divide to flow forward through the two outer passages, but unite again to flow backward through the center passage of the upper heating section to the exhaust flue at the rear. This double reverse in direction of flow gives, within compact space, a considerable travel for

the heated gases, with plenty of time for complete combustion and with a constantly diminishing heating surface from fire-box to exhaust flue.

As usual with double grate boilers of this general class, no direct fuel supply is required for the lower or secondary grate. The upper grate is charged with green bituminous or other fuel and an occasional slicing is all that is necessary to maintain an even fire. The lower grate is charged automatically with burning fuel dropped from the upper grate and only requires occasional shaking to discharge collected ashes. Monarch boilers are claimed to operate very satisfactorily on natural gas fuel, using almost any style of gas burner. Their construction is such that oil-burning attachments could be easily installed. Where either gas or oil fuel is to be standard, the possibility of quick conversion for the use of coal fuel must be considered as an addition to the reliability factor of the service.

MONARCH DOWN-DRAFT SMOKELESS BOILER.



PERFECTION DOWN-DRAFT SMOKELESS BOILER.

12.—Perfection Down-Draft Smokeless Boiler.

Entire absence of special mechanical devices for smoke prevention is a feature of the Perfection down-draft smokeless boiler, manufactured by the Titusville Iron Works Co., Titusville, Pa. By this elimination there is claimed for the boiler a gain in simplicity, economy, and reliability.

The Perfection boiler is a combination of the horizontal tubular and the portable locomotive types, and smoke combustion is accomplished by the combined effects of the down-draft, the double grate, and the refractory lining of fire-box and combustion chamber—all of them structural features, involving no special methods or apparatus for successful operation. Its upper grate, of the Hawley water-tube type, consists of two seamless drawn steel headers, the front 8 in. and the rear 10 in. in diameter, connected by seamless drawn steel tubes screwed into the rear and expanded into the front header. This upper grate surface is connected to the shell in such a manner as to draw its supply of cool water from the bottom of the boiler and discharge heated water near the water line, promoting circulation. Below the water grate, a second grate of cast-iron is installed.

The furnace, located under the cylindrical part of the boiler, is lined with 9-in. square fire-brick blocks 2½ in. thick, made especially for this purpose and held in place by an arrangement of cast-iron buckstays which allow burned or broken blocks to be easily replaced. A 2-in. air space between fire brick and casing is designed to prevent warping of sections and excessive radiation of heat. The rear combustion chamber sides are lined with heat-resisting composition held in place by cast-iron plates. The end is closed with a heavy frame supporting two doors over one opening which allows access to all tubes. These doors are lined with 2½ in. nonpareil insulating brick held in place by cast-iron liners.

In this boiler the upper grate acts as a gas producer for the volatile contents of the coal, which are carried down with the upper air supply into the combustion space between the upper and lower grates. There they meet a second supply of air at high temperature favorable to quick burning. During the combustion of fuel on the upper grate, small particles of burning coal fall through to the lower grate where they complete their combustion prior to rejection as ash. This double grate arangement produces within the fire-box an intense heat that helps toward complete combustion of these gases. The brick linings to the fire-box and the rear combustion chamber serve to retain heat and prevent the formation of smoke by cooling of these burning gases before complete combustion has been accomplished.

It is claimed for this boiler that it will produce good results with either anthracite, bituminous, or other fuels. The chamber above the water grate can carry a large reserve of fuel, in fact, can be entirely filled if desired.

New Data on Central Station Heating Rates.

In the October issue of the *Bulletin of the National District Heating Association* there is given an extensive summary of the heating rates obtaining in municipalities throughout the United States where central heating service is provided. Among the larger cities listed are Atlanta, Boston, Columbus, Chicago, Cleveland, Detroit, Denver, Grand Rapids, Kansas City, Milwaukee, Pittsburgh, Rochester (N. Y.), Seattle, San Francisco, Salt Lake City, and Toledo. Rates are given for both steam and water heating and these vary considerably with difference in coal prices in different sections. There is also a wide variation in the methods of computation and in the discounts allowed. A majority of the companies use the graded service charge, reducing unit charges, with increase in consumption, but here the similarity ceases, as the unit charges, minimum charges, and grade steps are special to each municipality. For water heating there is shown a range of from 15c to 65c per sq. ft. of radiation and where flat steam rates are still in effect, they run from 48c to 90c per sq. ft. of radiation. Most of the steam rates, however, are based upon metered condensation. An increasing number of companies include in their contracts a coal clause to protect themselves against price changes that can not be foreseen.

Guarantees Against Price Declines.

Arguments for and against the practice of giving guarantees against price declines, as carried on in the various industries, are set forth in a recent bulletin issued by the Fabricated Production Department of the Chamber of Commerce of the United States.

It is pointed out in the bulletin that the trade practice of guaranteeing

against price decline is used in a wide variety of forms, such as until date of shipment, until date of delivery, until a fixed date, until the goods are sold, guarantee against decline of vendor's price only and guarantee against decline of the market price.

Among the arguments in favor of the practice from the manufacturer's standpoint are the following:

"It secures orders for his product in advance of the needs of the purchaser, enabling him to run his factory more steadily and arrange the use of his labor and raw materials to better advantage; enables him to ship his product as soon as finished and avoid the expense of warehousing it; secures larger orders and a larger volume of business; makes it possible for him to ship in carloads and avoid the expense of handling smaller shipments; assists in marketing new brands; reduces the number of salesmen's trips, since an entire season's business can be secured in one order; prevents cancellations in a falling market; is a strong means of getting business; and is necessary to manufacturers of bulky product, difficult of storage."

Arguments favoring the practice from the wholesaler's and retailer's standpoints are as follows:

"It protects them against loss due to a falling market; permits early orders, avoids delays in shipment; insures ample stocks to meet unusual demands; permits ordering in large lots to save freight; permits placing orders more freely; responsibility for fixing prices should rest on the manufacturer because he is better posted concerning the prices of raw materials and primary markets; wholesaler's margin of profit is too small to risk market reductions; permits the handling of goods on a smaller margin, and therefore makes lower prices to consumer; enables small wholesalers to compete with larger concerns; enables small wholesalers to buy in large units; prevents manufacturers from selling direct to consumers, since the latter cannot order in advance; necessary where goods are shipped long distances."

Arguments in general *opposed* to the practice are as follows:

"That it is an unsound, unfair business practice. Unsound because it creates an artificial volume of orders for the manufacturer, on all of which his amount of net return is uncertain until a considerable time after all fabricating processes have been finished; unfair because it puts the wholesaler's and retailer's just shares of liability for market fluctuations upon the manufacturer, instead of preserving the equitable rule of requiring each trade agency to carry its own burden of liability.

"That the practice tends to keep prices up because if a considerable number of manufacturers in one line of production have guaranteed prices and have, therefore, placed themselves in a position to suffer loss if prices decline, their entire influence will naturally be exerted to prevent a decline.

"That if a majority of the manufacturers in one line of production have guaranteed prices and will lose if they decline, the price cannot be reduced, because none of that particular product can be secured except through the agency of the manufacturers who have guaranteed and who are bound to try to maintain the prices until the liability under their guarantee has been discharged.

"That the practice operates to harass the small manufacturer because he must, in competition with his more powerful business rivals, who are guaranteeing prices, also offer this inducement to purchasers although he is not able financially to safely incur such a responsibility.

"That it introduces into trade an element of uncertainty and encourages speculation, that it encourages overproduction on the part of the manufacturer in that, due to the abnormal orders received, the volume of possible business seems to be larger than it really is; that it disturbs the well-established rule, which has proven to be sound and conservative, of fixing finally the selling price of goods at the time of the transaction.

"That it tends to deceive both the manufacturer and wholesaler, because the latter, since he is guaranteed against loss, is tempted to relax his vigilance in watching and studying the basic influences in his market and in estimating conservatively his real needs, and the former (the manufacturer) has an abundance of orders in sight, but taken under a contract which may compel him to fill them at a loss."

Annual Meeting of American Gas Association.

Over 1000 delegates were in attendance at the second annual convention and exposition of the American Gas Association, which was held in New York, November 15-20, at the Hotel Pennsylvania. The roof garden of the hotel was given over entirely to the exhibition of gas equipment and appliances, many of which were of special interest to the heating industry.

Appointment of P. M. Beecher as Manager of Boiler Department of Utica Heater Company.

Announcement is made by the Utica Heater Co., Utica, N. Y., manufacturer of the Imperial super-smokeless boilers, that P. M. Beecher has been appointed manager of the company's boiler department. Mr. Beecher has already entered upon his duties and will make his headquarters at the company's main office in Utica.

Growth of Kewanee Boiler Company.

On the occasion of the opening of the new $1,000,000 addition to the plant of the Kewanee Boiler Co., in Kewanee, Ill., which was reported in last month's issue, some interesting facts regarding the company's career are furnished by Secretary J. P. Dugger. The company's first name, which was given to it in 1871 was the "Anderson Steamer and Heater Company." This later became the "Anderson Universal Steam Boiler Mfg. Company." In 1875, when W. E. Huxton became associated with the company, name was changed to the Huxton Steam Heater Company, which placed on the market the Huxton magazine-feed steel heating boiler, "a boiler," says Mr. Dugger, "with which the company for many years enjoyed a well-deserved success."

In the Centennial year of 1876 John H. Pierce became actively associated with the Huxton Steam Heater Company and from that time until 1904, Mr. Pierce's name was inseparably connected with the increasing manufacturing interests of Kewanee. Prior to 1876 he had been associated with his brother in the hardware business in Kewanee.

In 1883 the chronicler finds the first mention of the name of Emerit E. Baker as an official of the company. He had joined the company in 1873 when a lad of 18. During the ten intervening years from 1873 to 1883 he had risen from office boy to director of the company.

In the latter part of 1883 the Kewanee Rolling and Pipe Mills Company was added to the plant and we find the "old one-horse-power horse" of 1868 and the 40-H. P. engine of 1871 supplanted in 1883 by engines of 650 H. P., the plant then covering an aggregate of 1½ acres.

In 1884 the Kewanee Rolling and Pipe Mills Company and the Huxton Steam Heater Company were consolidated under the latter name. The next important change came in 1891 when the name of the Huxton Steam Heater Company was discontinued and that of the Western Tube Company adopted. In the spring of 1892 the Western Tube Company decided to discontinue the manufacture of boilers and boiler shop products.

It was in May of this year, 1892, that the Kewanee Boiler Company was organized," a company whose ownership and financial interests have always been entirely separate and apart from those of the parent company." As is well known, the Western Tube Company continued its career under the name of the National Tube Company and is at the present time the Walworth Mfg. Company.

On the initiative of E. E. Baker, the Kewanee Boiler Company was organized and incorporated in 1892 with a capital stock of $100,000. The business of the company was begun in the old boiler shop of the Western

Tube Company. During 1893 the company built an addition to the boiler shop on Main Street which is now the west end of the Walworth plant; with this addition the boiler shops occupied about 1½ acres and employed something like 100 men.

In 1900 the Kewanee Boiler Company sold this property to the Western Tube Company and purchased seven acres and erected new shops on its present site. In 1902 a cast-iron radiator foundry was added to the plant.

A few years later, about 1906, the agitation for smoke prevention brought into prominence the company's already well-known Kewanee firebox heating boiler. By equipping this boiler with a down-draft grate it came into wide use under the name of the Kewanee down-draft smokeless steel firebox heating boiler.

Besides marking the opening of its new additon, the celebration reported in last month's issue was also in honor of the twentieth anniversary of the company's removal to its present site. The company now has a plant occupying 32 acres, employing 1100 people, served by a power plant of 2500 nominal horse-power, a company of $2,500,000 capitalization, and with an annual production value expressed in seven figures.

During the recent World War the company fabricated and delivered to the government no less than 19,410 boilers, heaters and tanks, all within the nineteen months of war activities.

Cleveland's New Public Hall.

Some idea of the appearance of Cleveland's new public hall which, it is said, will be the largest structure of its kind in the United States, is given in the accompanying illustration. The building covers two city blocks and its roof area is nearly three acres. Its main auditorium or arena will have a seating capacity of 13,000. The total cost of the arena with its equipment will be $5,000,000.

CLEVELAND PUBLIC HALL, FROM THE EAST.

Herbert Hoover Made President of the American Engineering Council.

At the organization meeting of the American Engineering Council of the American Federated Engineering Societies, held in Washington, November 18. Herbert Hoover was elected president. Among the expressed objects of the council are the establishment of a Department of Public Works the creation of a federal budget system, the solution of transportation problems and conservation of the country's resources.

In his address as president-elect, Mr. Hoover outlined three sources of waste in production and suggested means of combating each. The sources mentioned were intermittent employment, unemployment that arises in shifting industrial currents, and strikes and lockouts. He stated that engineers were best qualified to undertake the great task outlined, inasmuch as they had no special economic interests for themselves in the constructive solution of the problems, their only interest being in creating a working force for public service.

NATIONAL TRADE EXTENSION BUREAU

Getting Down to Facts on Fixed Charges.

Since publishing the survey of a number of heating and plumbing contracting shops in Cleveland (reproduced in THE HEATING AND VENTILATING MAGAZINE for October, 1920), the National Trade Extension Bureau has compiled a revised table, based on the figures obtained in the survey and tabulated for a growing business.

One of the principal objects of the present table is to point out to the heating and plumbing contractors just how a fixed charge account should be apportioned. By using this table as a base, the contractor can make a careful analysis of his own business, comparing each item of expense with his own to see if the various items listed run in excess of those indicated in his own expense account. The table can also be used as a guide for determining the amount that should be spent for advertising and other items that are essential to good business management.

Attention is called to the fact that the present table makes allowance for an increased overhead expense during 1919. It is safe to say that the present year's "overhead" has increased in a small way over that of 1919. Just what that percentage amounts to cannot yet be determined because there are not avaliable sufficient figures and facts to warrant a definite statement.

The bureau is still anxious to receive additional detailed statements of operating expense from heating and plumbing contractors.

T. E. B. Representatives "on the Road."

Four representatives of the National Trade Extension Bureau have completed their training at the headquarters of the Bureau in Evansville, Ind., and are now "on the road" in various parts of the country engaged in helping the heating and plumbing contractors to conduct their business more profitably. Before being sent out, these men were given full knowledge of facts and conditions resulting from the bureau's nation-wide contact with the industry and thoroughly trained in effective methods of transmitting this information to the contractor.

As has been previously announced, it is the intention of the bureau to have a sufficient number of these field representatives to cover the entire territory of the United States at frequent periods, personally visiting the contractors in their territory and doing anything and everything that can be done in the way of supplying information that will enable the contractor to put into effect, in connection with his own business, those tried and successful practices which the National Trade Extension Bureau will have collected from all over the country.

Contractors who will be called upon by

A Chart of Fixed Charges or Operating Costs

Compiled from Actual Figures Obtained from Successful Heating and Plumbing Shops—Tabulated for a Growing Business.

ITEM	COLUMN	A	B	C	D	E	F	G	H	I	J	K	L
X	Volume of Business for Year	7,500	10,000	15,000	20,000	25,000	35,000	50,000	75,000	100,000	150,000	200,000	250,000
Y	Owners' Capital	750	1,000	1,500	2,000	2,500	3,500	5,000	7,500	10,000	10,000	12,000	15,000
Z	Borrowed Capital	425	675	850	1,000	1,500	2,000	3,000	4,000	4,000	5,000	5,000	6,000
	Overhead Accounts												
1	Misc. Office Expense (Sundries)	8	10	15	20	25	35	50	75	100	150	200	250
	Collections	(by the use of Cash Discount and Trade Acceptance, this item can be eliminated)											
	License Fee	5	5	5	5	5	5	5	5	5	5	5	5
	Telephone and Telegraph	65	75	100	125	125	125	125	135	145	145	150	160
	Light, Heat, Power and Water	15	20	25	50	60	60	65	75	100	100	125	125
	Stationery, Printing and Postage	22	35	55	70	85	110	150	190	235	275	320	365
	Trade Papers, Business Magazines	5	5	5	5	5	7	9	10	12	12	15	15
	Traveling Expense (Correction, Soliciting, Buying)	50	60	75	100	125	150	200	250	275	300	325	350
2	Office Salaries (Owner)	750	1,000	1,200	1,500	1,800	2,000	2,000	2,500	3,000	4,000	5,000	6,500
	Stenographer	350	500	600	600	700	750	750	1,000	1,000	1,000	1,200	1,500
	Bookkeeper				600	700	1,200	1,500	1,800	2,000	2,000	2,000	2,400
	Estimator							1,800	2,400	2,500	2,800	2,800	3,000
3	Auto Expense (Supt. and Owner's Business Car)			360	375	400	700	700	800	1,000	1,000	1,000	1,000
	Truck or Wagon Expense (Including driver, where charges are made for such services per trip)	350	280	425	360	406	528	2 Trucks 608	2 Trucks 500	2 Trucks 600	3 Trucks 1,125	3 Trucks 1,000	3 Trucks 800
	Depreciation of Wagons, Autos and Trucks	25	50	75	100	200	300	400	600	600	900	1,000	1,000
	Insurance (On Horses or Truck, where charges are made for such services per trip)	3	6	12	12	15	25	50	70	125	150	150	150
4	Advertising and Donations	110	150	225	285	325	375	450	600	750	900	1,050	1,200
5	Dues (Associated Plumbers and Steam Fitters)	36	36	36	50	50	50	50	50	50	50	50	50
	(Chamber of Commerce)		25	25	25	25	25	25	25	25	25	25	25
	(Other Commercial and Civic Organizations)						15	25	35	45	50	65	75
6	Interest on Owners' Capital	52	70	105	140	155	245	350	524	700	700	840	1,050
	Interest on Borrowed Money	26	35	52	70	105	140	210	280	280	350	350	420
7	Legal Expense				10	15	25	30	40	50	75	100	125
8	Taxes (City, State and County)	15	30	40	50	70	100	150	225	250	275	350	450
9	Misc. Store Expense	3	5	5	10	12	15	20	25	40	65	75	75
10	Allowances and Bad Accounts	37	50	75	100	125	150	200	300	400	500	500	500
11	Non-Productive Labor (Labor Not Chargeable)	8	10	15	20	25	35	50	75	100	150	200	250
	Foreman (Where ½ of Foreman's time is charged as productive labor)						625	625	625	625	625	1,250	1,250
	Stockman							600	1,000	1,500	1,800	1,800	1,800
12	Fire Insurance	5	9	11	15	19	26	37	56	75	100	150	225
	Liability Insurance	8	64	128	128	184	128	192	192	256	256	320	320
	Business Insurance	37	50	75	100	125	175	250	375	500	600	700	800
13	Rent (Shop and Warehouse, Garage and Yard)	180	240	300	480	600	780	1,000	1,500	1,500	1,800	2,000	2,500
14	Depreciation (Stock, Equipment and Building)	50	50	75	100	100	75	100	150	250	350	500	800
15	Damaged Material	4	5	7	10	12	18	30	45	60	75	100	125
16	Tools (Repairs and Depreciation)	15	20	30	40	50	70	100	150	200	300	400	500
17	Workman's Comp. Ins. (Based on Journeymen at $9.00 per day)	110 Days 24	275 Days 41	800 Days 73	900 Days 98	725 Days 122	1,000 Days 147	1,320 Days 179	1,925 Days 277	2,600 Days 391	3,600 Days 522	4,600 Days 652	5,600 Days 815
18	Misc. Shop Expense	5	5	10	10	13	20	30	50	60	60	75	100
	Oil, Candles, Paint, Gasoline, etc.	(These items are merchandise, and should be charged to the individual job requiring them)											
19	Total of Fixed Charge or Operating Cost	2,263	2,941	4,239	5,663	6.783	9,234	13,115	17,009	19,804	23,590	26,842	31,075
20	Percentage of Overhead (To be added to the cost of labor and material)	49.7%	47.8%	45.1%	45.2%	42.5%	40.8%	40.5%	33.3%	27.9%	20.9%	17.3%	15.8%
21	Percentage of Overhead (Based on sale price)	30.2%	29.4%	28.3%	28.3%	27.1%	26.4%	26.2%	22.7%	19.8%	15.7%	13.4%	12.4%
22	Discount (That can be given from 100% list to make 10% profit)	17.6%	18.7%	20.2%	20.2%	21.6%	22.5%	22.7%	26.7%	29.6%	33.5%	35.5%	36.3%
23	Discount (That can be given from 100% list to make 10% profit if 5% is allowed for cash)	13.4% +5%	14.4% +5%	16% +5%	15.9% +5%	17.5% +5%	18.5% +5%	18.6% +5%	22.8% +5%	25.9% +5%	30% +5%	32.6% +5%	32.9% +5%
24	Net Cash Profit for Year	682	909	1,364	1,818	2,273	3,182	4,545	6,818	9,091	13,636	18,182	22,727

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the bureau's representatives are asked to bear in mind that the only purpose of such calls is in bringing to the contractor some helpful ideas that will benefit his business, or getting from him some ideas of a similar nature that the up-to-date contractor will be glad to contribute to benefit the industry, and thereby improve the conditions under which he himself will be able to do business.

The four representatives of the bureau already appointed are Daniel L. Hanson, a well-known writer in trade journals; S. F. Martin, a former heating and plumbing contractor; R. E. Maloney and L. A. Dunne.

Another appointee who was to start out later, is Professor Arthur Bateman, formerly connected with the American Correspondence Schools of Chicago and a well-known instructor in sanitary engineering. Professor Bateman has the added advantage of being a practical mechanic in both steam fitting and plumbing work.

Ventilation of Dyehouses and Bleacheries.

Those who have had experience in the ventilation of dyehouses and bleacheries will agree that these buildings, with their fog and incessant dripping of moisture from the roof, offer one of the most difficult problems the ventilating engineer has to solve. How this problem was successfully met by a type of installation designed by the Buffalo Forge Co., Buffalo, N. Y., is described in a recent bulletin, published by this company, which includes photographs of the interior during various periods of the operations. The statement is made in the foreword that the company's engineers, after exhaustive experimentation and study, have solved the problem of successful dyehouse and bleachery ventilation. The information gained, it is added, is now made available to all interested. As stated, the problem in dyehouse and bleachery ventilation is, first, the removal of large volumes of steam and water vapor given off by the kiers, dyeing machines and tubs and, second, preventing this moisture from condensing on the cool interior surfaces of the building. To meet the condition of excessive steam and vapor it has been found best to dissipate this by introducing warm air directly over the machine from which the excess emanates. The quantity of air needed is governed by the actual conditions. To prevent condensation a film of heated air is made to move along the surfaces upon which the condensation tends to settle. Photographic reproductions of the interior of a typical plant where the Buffalo system is installed are presented to prove the efficiency and effectiveness of the companys methods. Seven pictures were taken of the same room at one-minute intervals, the different periods of transformation being clearly indicated. Other views show installations in various buildings.

New Publications.

CONDENSED CATALOGUES OF MECHANICAL EQUIPMENT for 1920, published by the American Society of Mechanical Engineers, New York, are now being editions was based upon society membership and consequently outside distribution was strictly limited, but this distributed. The printing of former year an extra supply has been provided for sale to non-members. The price is $4.00, postpaid. The volume contains 745 pages of condensed catalogue data, a 211-page mechanical equipment directory, or "Buyers' Guide," a classified table of contents, and a directory of consulting engineers, as well as the usual alphabetical index of manufacturers whose product is described. May be obtained from the society direct, or through the book department of THE HEATING AND VENTILATING MAGAZINE.

THE FIREMAN'S HANDBOOK AND GUIDE TO FUEL ECONOMY, by Charles F. Wade, published by Longmans, Green & Co., New York, is a useful manual for the use of stokers, furnacemen, foremen, and others operating and controlling boiler and furnace equipment. The subject is treated in a very elementary way and in language that will be understood by the practical man of little technical knowledge. The book touches briefly on fuel values, steam qualities, furnace firing, mechanical stokers, superheaters, feed,

FIG. 1—ATMOSPHERIC CONDITION IN TYPICAL UNVENTILATED DYE HOUSE.

FIG. 2—SAME LOCATION AFTER THREE MINUTES OF INTENSIVE VENTILATION.

FIG. 3—VIEW AFTER FOUR MINUTES OF VENTILATION.

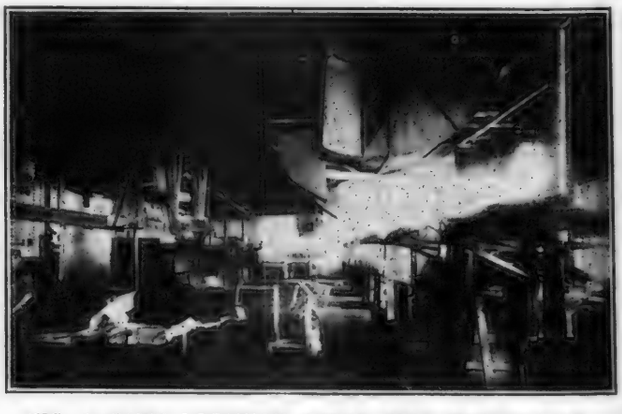


FIG. 4—SAME LOCATION AFTER FIVE MINUTES OF EFFECTIVE VENTILATION.

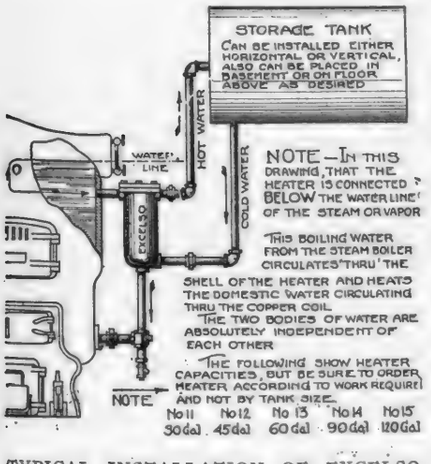
fittings, air leakage, efficiency, and rules for operation and care of boilers. This handbook will be a help to the man-behind-the-boiler as an introduction to more thorough treatment of the various topics upon which it makes a good start. Size 5 x 7 in. Pp. 84, with 29 illustrations. Cardboard, $1.00 net. Obtainable either from the publisher or through the book department of THE HEATING AND VENTILATING MAGAZINE.

Trade Literature.

VALVE WORLD for November, 1920, the monthly periodical of Crane Co., Chicago, presents an article by M. W. Link entitled, "More Power; More Profit; Through Fuel Economy." The topic is a timely one in this period of high fuel prices and Mr. Link covers many phases of it, bearing on the product and practice of this company. An article by Herbert T. Wade on "Rational Methods of Using the Metric System" appearing in the same issue, is also worth reading.

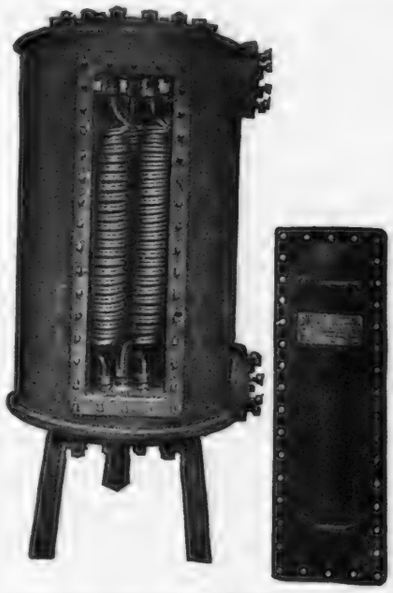
RICHMOND MANUAL for 1920, recently issued by the Richmond Radiator Co., New York, is a handy pocket-sized catalogue of company products giving illustrations and tabulation of sizes, capacities, prices, etc., on round and sectional heating boilers, radiators of both regular and special design, vacuum cleaners, porcelain enameled ware, valves, regulators, fittings, and boiler room supplies. At the back of the catalogue there is a 59-page section devoted to general technical information relating to boiler operation and heating practice. Size 3½ x 6½ in. Pp. 203.

EXCELSO WATER HEATERS are advocated in a striking folder just issued by the Excelso Specialty Works, Buffalo, N. Y. The pictorial features of the pamphlet include a view of the Indian method of heating water in a deerskin container by the addition of hot stones, contrasted with the Excelso heater method. Various applications are presented of Excelso water heaters under different conditions.


STORAGE TANK
CAN BE INSTALLED EITHER HORIZONTAL OR VERTICAL, ALSO CAN BE PLACED IN BASEMENT OR ON FLOOR ABOVE AS DESIRED
HOT WATER
COLD WATER
WATER LINE
EXCELSO
NOTE—IN THIS DRAWING, THAT THE HEATER IS CONNECTED BELOW THE WATER LINE OF THE STEAM OR VAPOR
THIS BOILING WATER FROM THE STEAM BOILER CIRCULATES THRU THE SHELL OF THE HEATER AND HEATS THE DOMESTIC WATER CIRCULATING THRU THE COPPER COIL
THE TWO BODIES OF WATER ARE ABSOLUTELY INDEPENDENT OF EACH OTHER
NOTE
THE FOLLOWING SHOW HEATER CAPACITIES, BUT BE SURE TO ORDER HEATER ACCORDING TO WORK REQUIRED AND NOT BY TANK SIZE.
No 11 30 Gal
No 12 45 Gal
No 13 60 Gal
No 14 90 Gal
No 15 120 Gal

TYPICAL INSTALLATION OF EXCELSO WATER HEATER.

REILLY WATER HEATERS are described in Bulletin No. 260 of the Griscom-Russell Co., New York, which covers both structural features and operating suggestions, together with connections diagrams for installing this equipment. The Reilly heater is of the multicoil type with helical coils of seamless drawn copper tubing, attached without brazing to ring manifolds in the shell or casing by means of patented copper faced screwed union joints. The helical form of the water tubes increases the path of flow in the steam chamber and gives greater disturbance in the water stream with a consequent higher heat transfer. Crimping of the tubes for their entire length increases this effect. The coils are identical in size and interchangeable. A large door opening to



CONSTRUCTION OF REILLY WATER HEATER.

the shell permits inspection and repair without disturbance of either steam or water connections. The only tool needed for removing and replacing coils is a wrench. Size 6 x 9 in. Pp. 16.

Buffalo Standard Pipe Coil Heaters.

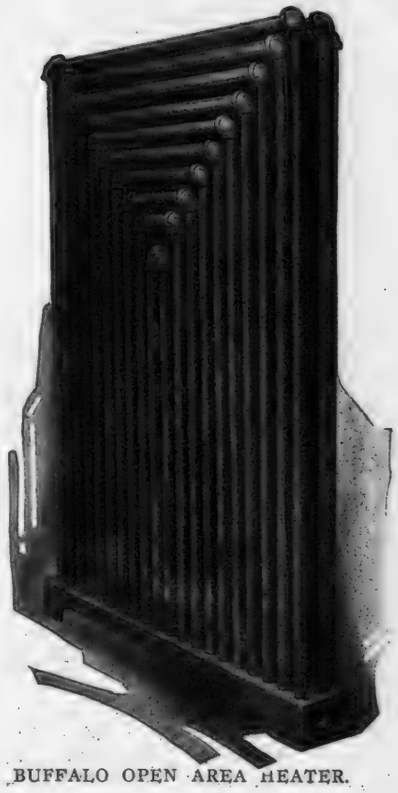
An idea of the requirements to be met in the design of a fan heater are given in the recent catalogue devoted to Buffalo standard pipe coil heaters, manufactured by the Buffalo Forge Co., Buffalo, N. Y. As is well known, these requirements are often severe and vary over wide limits. The amount of air passing through the heater may be any quantity within the limits of the fan capacity and this varying quantity of air, along with the fluctuations in the temperature of the air to be heated, make the demands on the heater extremely irregular.

Buffalo standard heaters are usually made up in the return-bend pattern but where desired the open-area pattern

BUFFALO RETURN BEND HEATER.

is furnished. The difference between these two types is shown in the accompanying illustrations.

As stated in the catalogue, the heaters excel in the following points: (1) circulation of steam; (2) drainage, the design of the base giving no opportunity for the pocketing of water; (3) efficiency of radiating surface and low resistance to air flow secured through the proportioning of the air passage; and (4) the method of independently



BUFFALO OPEN AREA HEATER.

connecting each section to the steam main and the control of the steam supply by valves so that as many sections as desired may be in operation.

The heaters are made up of 1-in. full-weight steel pipe screwed into cast-iron bases, the pipes being spaced on 2⅝-in. centers. These units are made four rows deep and are called four-row sections.

Convention of Farnsworth Company Representatives.

Supplementing the report published last month of the first annual convention of the district representatives, salesmen, office and shop employees of the Farnsworth Co., Conshohocken, Pa., we are able to present herewith a group picture taken at the residence of President F. C. Farnsworth. Mr. Farnsworth is shown standing in the center of the group.

CONVENTION OF FARNSWORTH COMPANY STAFF.

Book Prices Raised.

Book prices have recently undergone a further revision upward, a recent announcement from John Wiley & Sons, Inc., New York, stating that hereafter the price of Harding and Willard's "Mechanical Equipment of Buildings" will be as follows: Vol. 1 (Heating and Ventilation) $6.00, instead of $5.00; and Vol. II (Power Plants and Refrigeration), $7.00 instead of $6.00.

Current Heating and Ventilating Literature.

Under this heading is published each month an index of the important articles on the subject of heating and ventilation that have appeared in the columns of our contemporaries. Copies of any of the journals containing the article mentioned may be obtained from THE HEATING AND VENTILATING MAGAZINE *on receipt of the stated price.*

STEAM.

FLOW IN PIPES. Flow of Steam Through Pipes and Fittings, M. C. Stuart and M. H. Russell. Jl. Am. Soc. Naval Engrs., vol. 32, no. 3 ,Aug. 1920, pp. 472-480, 5 figs. Charts constructed from Carpenter formula. 60c.

TUNNELS.

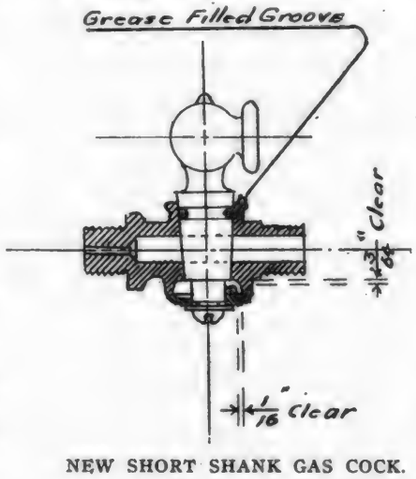
VEHICULAR. Bridge Versus Tunnel for the Proposed Hudson River Crossing at New York City, J. A. L. Waddell. Proc. Am. Soc. of Civil Engrs., vol. 46, no. 6, Aug. 1920, pp. 943-947, 1 fig. Costs are estimated to be: For highway bridge $32,500,000; for four highway tunnels $49,000,000; for electric-railway bridge, $34,500,000; for four double-track electric-railway tunnels, $48,000,000; and for eight single-track, electric--railway tunnels, $30,000,000. 60c.

VENTILATION.

SHIPS. Ventilating Systems, G. A. Bisset. Int. Mar. Eng., vol. 25, no. 9, Sept. 1920, pp. 720-724, 3 figs., partly on supp. plate. Graphic method of determining sizes of mains and ducts for mechanical ventilation. Calculations are based on General Specifications of U. S. Navy using coefficient of friction for ordinary piping of 0.0001. 60c.

Construction of Improved Type of Gas Cock.

The simple modification of the ordinary gas cock, referred to in last month's issue, as applied to stoves and other kinds of ground key work for gas, air and oil, is shown in the accompanying illustration. This modification is designed to eliminate entirely the stop pin or post. A supplementary feature is a peripheral groove in the taper of the key which acts not only as a grease cup but, by reason of its being at the upper end, also acts as a packing against dust and leaks. Where it is desirable to use a spring ring washer or a felt washer in place of grease, the groove permits this to be done. The device is manufactured by the Aws Mfg. Co., 398 Harman St., Brooklyn, N. Y.



NEW SHORT SHANK GAS COCK.

How One Manufacturer Solved the Housing Problem.

One of the many housing developments designed to relieve the shortage of workmen's houses is being projected in the East by a large manufacturing company which employs several thousand men. The housing shortage compelled many men to live long distances from the plant; and it was to provide for these as well as to improve living conditions that the company decided to build.

The development is an ideal one. A complete settlement has been laid out, consisting of single and duplex houses, boarding houses, a club house, restaurant and the necessary streets and sidewalks, sewer, water and electrical distribution systems. Concrete construction is being used for all the houses, some of the roads and even the sewer tile.

The construction of this complete development is being done by Dwight P. Robinson & Co., Inc., New York.

Deaths.

RICHARD D. KIMBALL, president of the R. D. Kimball Co., Boston, Mass., heating and ventilating engineers, died at his home in Alton Bay, N. H., November 10. He was 73 years old. During the past few years Mr. Kimball had not been in good health and his business interests were taken care of by five of his six sons who were associated with him.

Coming to Boston when a young man Mr. Kimball made an enviable name for himself in the heating and ventilating engineering field. He was the originator of a number of heating devices which are now regularly used in railway cars, school houses and other buildings. His firm had many notable engineering installations to its credit, such as the State House in Boston, the State capitols in Jefferson, Mo., and in Olympia, Wash. He is survived by his widow and six sons, one of whom is mayor of Walden. Another son, Dwight D. Kimball, is in charge of the New York branch of the firm and is a former president of the American Society of Heating and Ventilating Engineers.

AT A BARGAIN

1000 New Nickel-Plated ½ in. Illinois Engineering Company's Radiator Trap Valves.

Thomas Pump Works,
154 Spring Street, New York

THE IDEAL TYPE "A" HEAT MACHINE

WHEN planning the basement of a new or remodeled house why not provide in it commodious living quarters? Conversion of the usual damp and dirty cellar into warm and recreational rooms is now the vogue, through use of the new "IDEAL TYPE 'A' HEAT MACHINE."

An average fuel saving of 33⅓% is shown by the tabulated results of several thousand IDEAL Type "A" Heat Machine installations.

Write for catalog with test-chart records of efficiency and economy.

AMERICAN RADIATOR COMPANY

Branches and Showrooms in all large Cities

Makers of the world-famous IDEAL Boilers and American Radiators

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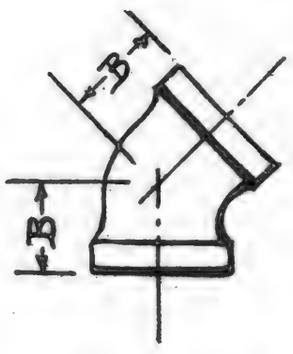
THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

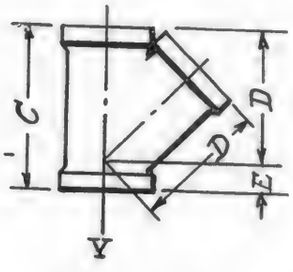
FITTINGS.

Standard Weight Cast-Iron Screwed Fittings.

125 Lbs. Working Pressure.



45° ELI



REDUCER

Size of Fitting In. Diam.	B	C	D	E	R
	Inches, Diam.				
1/4	3/4	.....	.....	.....	.....
3/8	13/16	.....	.....	.....	.....
1/2	7/8	2 1/2	1 7/8	5/8	.....
3/4	1	3	2 1/4	3/4	.....
1	1 1/8	3 1/2	2 3/4	3/4	.....
1 1/4	1 5/16	4 1/4	3 1/4	1	.....
1 1/2	1 7/16	4 7/8	3 13/16	1 1/16	.....
2	1 11/16	5 3/4	4 1/2	1 1/4	.....
2 1/2	1 15/16	6 1/4	5 3/16	1 1/16	.....
3	2 3/16	7 7/8	6 1/8	1 3/4	2 15/16
3 1/2	2 3/8	8 7/8	6 7/8	2	3 1/8
4	2 5/8	9 3/4	7 5/8	2 1/8	3 3/8
4 1/2	2 13/16	11 5/8	9 1/4	2 3/8	3 5/8
5	3 1/16	11 5/8	9 1/4	2 3/8	3 7/8
6	3 7/16	13 7/16	10 3/4	2 11/16	4 3/8
7	3 7/8	15 1/4	12 1/4	3	4 13/16
8	4 1/4	16 15/16	13 5/8	3 5/16	5 1/4
9	4 11/16	20 11/16	16 3/4	3 15/16	5 11/16
10	5 3/16	20 11/16	16 3/4	3 15/16	6 3/16
12	6	24 1/8	19 5/8	4 1/2	7 1/8

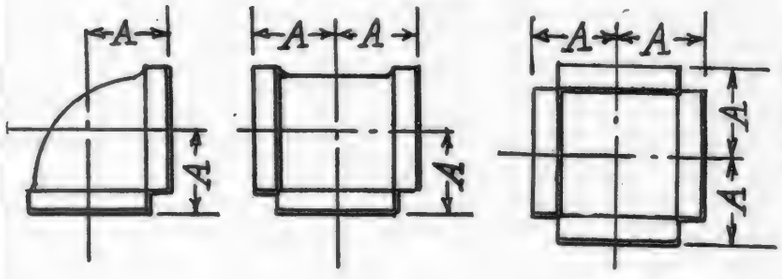
Note: Y's reducing on the branch take same dimensions as straight fittings. Above dimensions subject to slight variations and based on fittings as made by Crane Co.

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

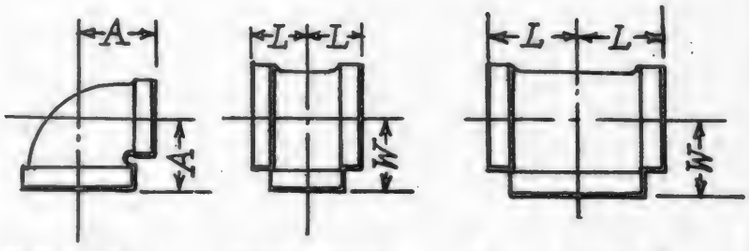
FITTINGS.

Extra-Heavy Cast-Iron Screwed Fittings.

250 lbs. Working Pressure



ELL TEE CROSS



RED. ELL RED. TEE BULLHEAD TEE

Run In. Diam.		Branch In. Diam.		A In. Diam.	L In. Diam	W In. Diam.
½	Straight			1 5/32	.....	.....
½	x	¾	Bh.	.....	1 25/64	1 21/64
½	x	1	Bh.	.....	1 19/32	1 25/64
¾	x	½	Red.	.....	1 21/64	1 23/64
¾	Straight			1 3/8	.....	.....
¾	x	1	Bh.	.....	1 21/32	1 33/64
¾	x	1¼	Bh.	.....	1 7/8	1 41/64
1	x	½	Red.	.....	1 25/64	1 19/32
1	x	¾	Red.	.....	1 33/64	1 21/32
1	Straight			1 19/32	.....	.....
1	x	1¼	Bh.	.....	2 3/32	1 29/32
1¼	x	½	Red.	.....	1 33/64	1 13/16
1¼	x	¾	Red.	.....	1 41/64	1 7/8
1¼	x	1	Red.	.....	1 27/32	1 15/16
1¼	Straight			1 15/16	.....	.....
1¼	x	1½	Bh.	.....	2 7/32	2 1/8
1¼	x	2	Bh.	.....	2 9/16	2 1/4

NOTE—For all reducing (Red.) and bullhead (Bh.) tees size of run is given first and size of branch second. Fittings reducing on the run retain the same dimensions as corresponding fittings without such reduction.

Above dimensions subject to slight variation and based on fittings as made by Walworth Mfg. Co.

(Continued on Data Sheet No. 109-E)

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

FITTINGS.

Extra-Heavy Cast-Iron Screwed Fittings.

250 lbs. Working Pressure

(*Continued from Data Sheet No. 109-D*)

Run In. Diam.		Branch In. Diam.		A In. Diam.	L In. Diam	W In. Diam.
1½	x	½	Red.	.....	1 35/64	1 31/32
1½	x	¾	Red.	.....	1 45/64	2 1/32
1½	x	1	Red.	.....	1 29/32	2 3/32
1½	x	1¼	Red.	.....	2 1/8	2 7/32
1½	Straight			2 1/16	.....	.....
1½	x	2	Bh.	.....	2 5/8	2 13/32
1½	x	2½	Bh.	.....	3 1/32	2 17/32
2	x	½	Red.	.....	1 45/64	2 5/16
2	x	¾	Red.	.....	1 53/64	2 3/8
2	x	1	Red.	.....	2 1/32	2 7/16
2	x	1¼	Red.	.....	2 1/4	2 9/16
2	x	1½	Red.	.....	2 13/32	2 5/8
2	Straight			2 1/2	.....	.....
2	x	2½	Bh.	.....	3 5/32	2 1/8
2	x	3	Bh.	.....	3 9/16	3 1/8
2½	x	1	Red.	.....	2 5/32	2 27/32
2½	x	1¼	Red.	.....	2 3/8	2 31/32
2½	x	1½	Red.	.....	2 17/32	3 1/32
2½	x	2	Red.	.....	2 7/8	3 5/32
2½	Straight			3	.....	.....
2½	x	3	Bh.	.....	3 11/16	3 17/32
2½	x	3½	Bh.	.....	4	3 19/32
2½	x	4	Bh.	.....	4 13/32	3 23/32
3	x	1	Red.	.....	2 13/32	3 1/4
3	x	1¼	Red.	.....	2 7/8	3 3/8
3	x	1½	Red.	.....	2 25/32	3 7/16
3	x	2	Red.	.....	3 1/8	3 9/16
3	x	2½	Red.	.....	3 17/32	3 11/16
3	Straight			3 11/16	.....	.....
3	x	3½	Bh.	.....	4 1/4	4
3	x	4	Bh.	.....	4 21/32	4 1/8
3½	x	1½	Red.	.....	2 27/32	3 3/4
3½	x	2	Red.	.....	3 3/16	3 7/8
3½	x	2½	Red.	.....	3 19/32	4
3½	x	3	Red.	.....	4	4 1/4
3½	Straight			4 1/32	.....	.....
3½	x	4	Bh.	.....	4 23/32	4 7/16
4	x	1	Red.	.....	2 19/32	3 31/32
4	x	1½	Red.	.....	2 29/32	4 5/32
4	x	2	Red.	.....	3 5/16	4 9/32
4	x	2½	Red.	.....	3 23/32	4 13/32
4	x	3	Red.	.....	4 1/8	4 21/32
4	x	3½	Red.	.....	4 7/16	4 23/32
4	Straight			4 15/32	.....	.....
4	x	5	Bh.	.....	5 13/32	5 3/32
4	x	6	Bh.	.....	6 3/32	5 5/32

(*Concluded on Data Sheet No. 109-F*)

THE HEATING AND VENTILATING MAGAZINE—1123 BROADWAY, N. Y. CITY

FITTINGS.

Extra-Heavy Cast-Iron Screwed Fittings.

250 lbs. Working Pressure

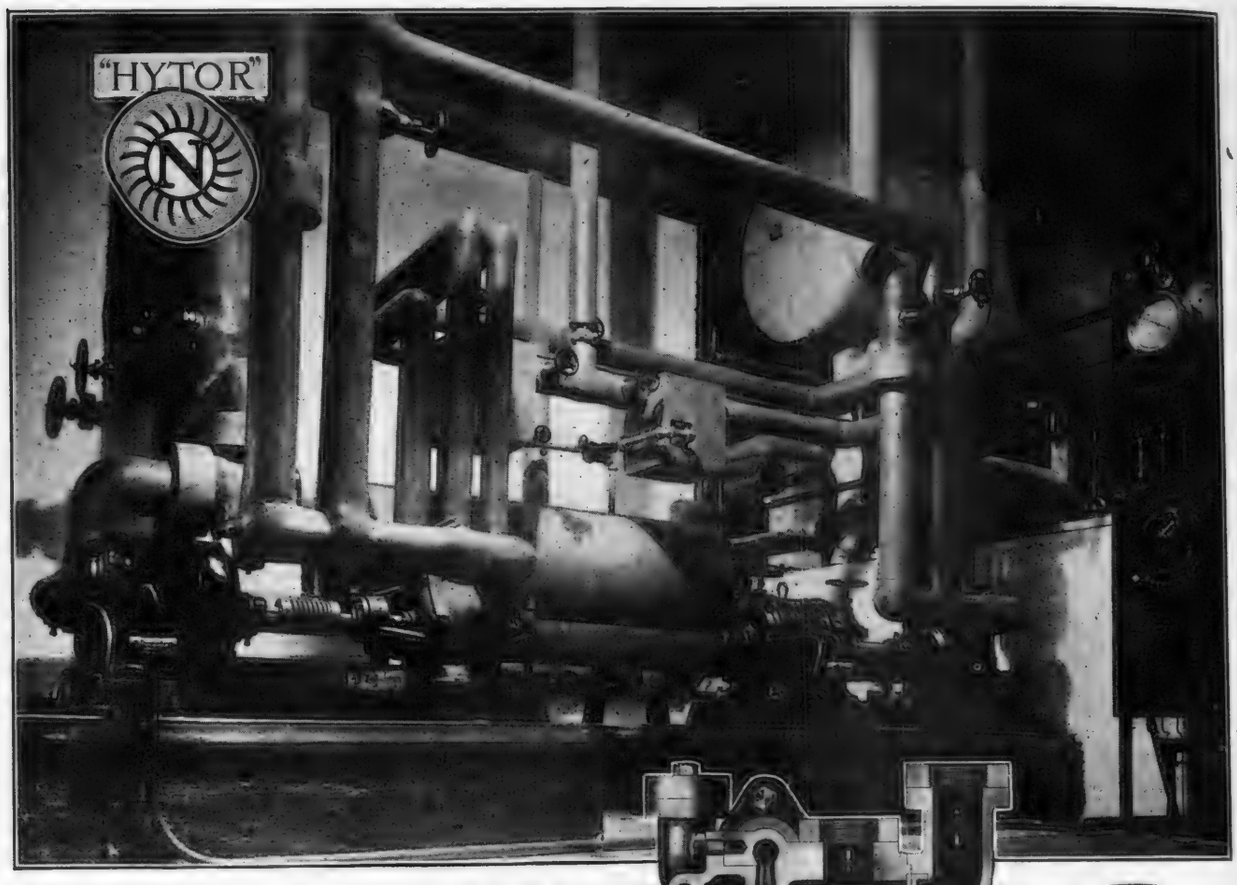
(Concluded from Data Sheet No. 109-E)

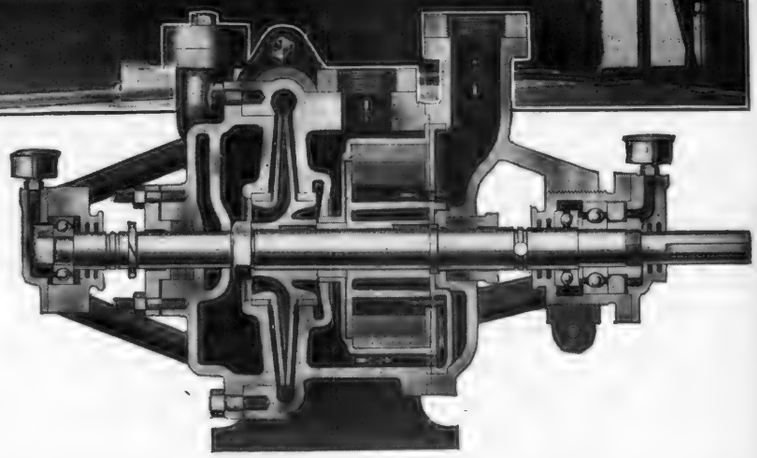
Run In. Diam.		Branch In. Diam.		A In. Diam.	L In. Diam	W In. Diam.
5	x	1½	Red.	.....	3 7/32	4 23/32
4	x	2	Red.	.....	3 9/16	4 27/32
5	x	3	Red.	.....	4 3/8	5 7/32
5	x	4	Red.	.....	5 3/32	5 15/32
5	Straight			6 11/32	.....	.....
5	x	6	Bh.	.....	6 11/32	5 23/32
6	x	2	Red.	.....	3 5/8	5 17/32
6	x	3	Red.	.....	4 7/16	5 27/32
6	x	4	Red.	.....	5 5/32	6 3/32
6	x	5	Red.	.....	5 23/32	6 11/32
6	Straight			5 13/16	.....	.....
6	x	8	Bh.	.....	7 17/32	6 17/32
8	x	2	Red.	.....	3 3/4	6 21/32
8	x	4	Red.	.....	5 9/32	7 7/32
8	x	6	Red.	.....	6 17/32	7 17/32
8	Straight			7 3/16	.....	.....

NOTE—For all reducing (Red.) and bullhead (Bh.) tees size of run is given first and the size of branch second. Fittings reducing on the run retain the same dimensions as corresponding fittings without such reduction.

Above dimensions subject to slight variation and based on fittings as made by Walworth Mfg. Co.

EFFICIENT HEATING *demands the* JENNINGS PUMP





Duplex E Unit, Continuous Operation

New N. Y., N. H. & H. Railway Terminal, New Haven, Conn.

Capacity each pump 65,000 sq. ft. direct radiation; air capacity 42 cubic feet per minute in addition to a water capacity of 90 gallons per minute.

The motors are only five horse power

THE Jennings Pump consists of two independent turbine units, an air pump and a water pump. As each material is handled separately, the boiler pressure is against the water only. The air and vapor, approximately four-fifths of the volume handled, are delivered to atmosphere without back pressure. The saving in horse power is over fifty per cent.

Because of its compact design, this equipment can be installed in less than one-third the space necessary with other apparatus. All interior parts are bronze, supported on annular ball bearings mounted outside of casing. Moving parts revolve without contact.

There are many other reasons why the Jennings is being installed on practically all of the big jobs. Bulletin No. 8 gives them in detail. Write for it.

NASH ENGINEERING COMPANY
SOUTH NORWALK, CONN., U. S. A.

TRADE AND MISCELLANEOUS NOTES

Coming Events.

January 26-28, 1921—Annual meeting of the American Society of Heating and Ventilating Engineers, in Philadelphia, Pa. A preliminary business session will be held in New York, January 25.

Miscellaneous Notes.

Washington, D. C.—A site for the new building in Washington which is to serve as a home for the National Academy of Sciences and the National Research Council has recently been obtained. It comprises the entire block bounded by B and C streets and Twenty-first and Twenty-second streets, Northwest, and it faces the Lincoln Memorial in Potomac Park. The site will cost about $200,000. Funds for the erection of the building have been provided by the Carnegie Corporation of New York.

Federated American Engineering Societies, it is announced, now consists of the following organizations: Alabama Technical Association, American Institute of Chemical Engineers, American Institute of Electrical Engineers, American Institute of Mining and Metallurgical Engineers, American Society of Agricultural Engineers, American Society of Mechanical Engineers, Detroit Engineering Society, Engineering Association of Nashville, Engineering Society of Buffalo, Florida Engineering Society, Kansas Engineering Society, Technical Club of Dallas, The Cleveland Engineering Society, The Society of Industrial Engineers. Twenty-seven additional societies have been invited to become charter members and are now considering the question of acceptance.

International Exposition of Industries is the title given to the displays now centered permanently in the Grand Central Palace, New York, operated by the Merchants' and Manufacturers' Exchange of New York. Among the exhibitors are the Buffalo Forge Co., Buffalo Steam Pump Co., International Heater Co., Sprague Electric Works, B. F. Sturtevant Co., J. C. Tagliabue Mfg. Co., Thermal Appliance Co., Thermograde Valve Co., Westinghouse Electric & Mfg. Co. and J. H. Williams & Co.

Associated General Contractors will hold their annual meeting in New Orleans, La., January 25-27, 1921. Headquarters will be at The Grunewald.

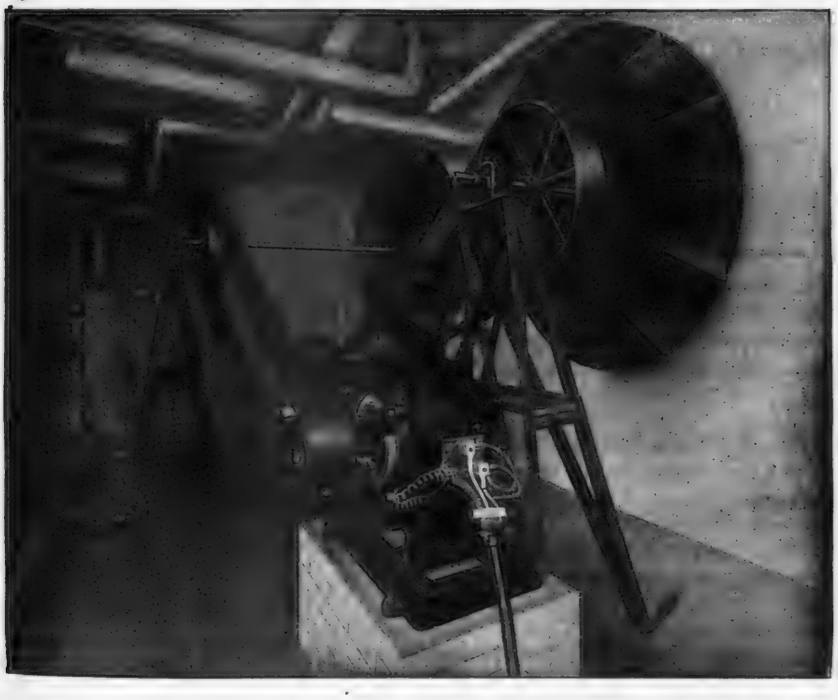
Engineering Society of Western Massachusetts made an inspection of the boiler and radiator plant of the H. B. Smith Co., Westfield, Mass., in connection with its meeting in Westfield, November 11. At the professional session in the evening, Professor L. P. Breckenridge of Yale University addressed the society on "The Evoluton of the Cast-Iron Heating Boiler as Related to the Problem of Power and Fuel."

National Safety Council announces the appointment of John J. Lamb as safety engineer at the headquarters office of the council, succeeding R. M. Guerrant, resigned. Mr. Lamb will draft some of the "Safe Practices" pamphlets and sectional bulletins, a part of the council's work on safety codes and other engineering work. The American Engineering Standards Committee has assigned to the council and to the American Society of Mechanical Engineers jointly the sponsorship for a standard color scheme for pipe

HOWARD & MORSE

45 FULTON STREET, NEW YORK

VENTILATING ENGINEERS AND CONTRACTORS



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Duplex Cone Fans

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Motors, Duct Work and Wiring

Aligning, Rigging, Hoisting

GET OUR PRICES, PROFIT BY OUR EXPERIENCE OF LONG STANDING.

SEND FOR CATALOGUE.

lines in the power plants and factories.

Chicago, Ill.—Housing conditions in Chicago were shown in recent testimony before the United States Senate Committee on Reconstruction to be the worst of any revealed by the investigation. D. J. Rosenthal, managing director of the Chicago Housing Association, testified that there is an immediate need of 50,000 houses or apartments, as that number of people are living in improper conditions, in attics, cellars, four in a bed, in closets and hallways. Nearly every witness blamed the scarcity of mortgage money and the exorbitant cost of what was available, for the decline of production of houses. It was also brought out that even if money were now available, builders would not build until the cost of materials was reduced all along the line and labor played up to greater efficiency, even if wages should not also be substantially reduced. Governmental assistance was so frequently urged and in such varied ways, that both Senator Calder and Senator Kenyon took pains to point out that wherever this had been tried, notably in England, nothing had been gained, for not only had private enterprise been driven out of the field, but the cost of production had been greater than if the problem had been left to private producers.

Senator Calder believed, he said, that a breaking up of trade combinations had begun and that prices had begun to recede and labor to return toward former levels of productiveness. He was more than ever convinced that the financial needs of the building industry could not be met under present conditions of Federal taxation. What form the required legislation should take was still to be determined.

National Thrift Week will be observed January 17-23. Each day of the week is to be set aside to emphasize a special phase of thrift, as follows: Monday, January 17, Benjamin Franklin's birthday, National Thrift Day or Bank Day; Tuesday, January 18, Budget Day; Wednesday, January 19, National Life Insurance Day; Thursday, January 20, "Own-Your-Own-Home" Day; Friday, January 21, "Make-a-Will" Day; Saturday, January 22, "Pay-Your-Bills-

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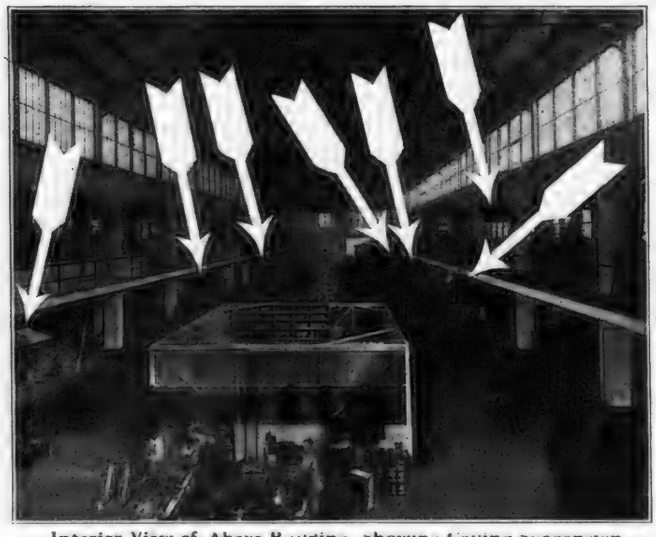
circulate heat at the floor level where it belongs—to obtain economical heating.

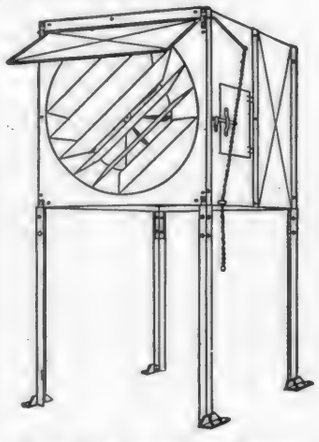
Less Costly to Maintain than Direct Radiation or Blast Systems

Particularly desirable for "Monitor or Saw Tooth" roof type of buildings. A correct solution for local cold spots or inadequate systems.

Exterior View of Monitor Type Building Occupied by Service Station Equipment Co., Chicago, Ill., Equipped with Ilgair Unit Heaters



Interior View of Above Building, Showing Ceiling Suspension Type of Ilgair Unit Heaters



Floor Type Ilgair Unit Heater, also made for Ceiling Suspension

Orders for Heating Systems to be Installed this Winter Should be Placed Now

The Present Day Coal Situation Demands Heating Economy

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ILG ELECTRIC VENTILATING CO.

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Branches in all large cities

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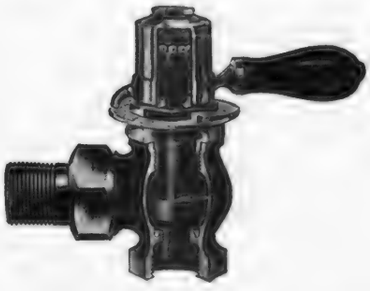
Insure Satisfaction

A Valve for Every System



Write for Catalogue and Discounts

The Dole Valve Company

1923 Carroll St. CHICAGO

JOHNS-MANVILLE Radiator Trap

—backed by real service

JOHNS-MANVILLE service means more than a guarantee of satisfactory performance. It means fair prices and co-operation in every other way.

That's why the Johns-Manville Radiator Trap is recommended and used by steamfitters. Ask the nearest branch for prices and complete details.

How it Works

The only moving part in a Johns-Manville Radiator Trap is a hollow copper ball which floats up and down with the water level in the trap. When the water level drops, the ball drops, gradually rolling over the discharge orifice of the trap, thus throttling down the outflow and maintaining sufficient water in the trap to provide a water seal and prevent leakage of steam. When the water level raises the ball, the discharge orifice is exposed and the water is free to flow out of the trap.

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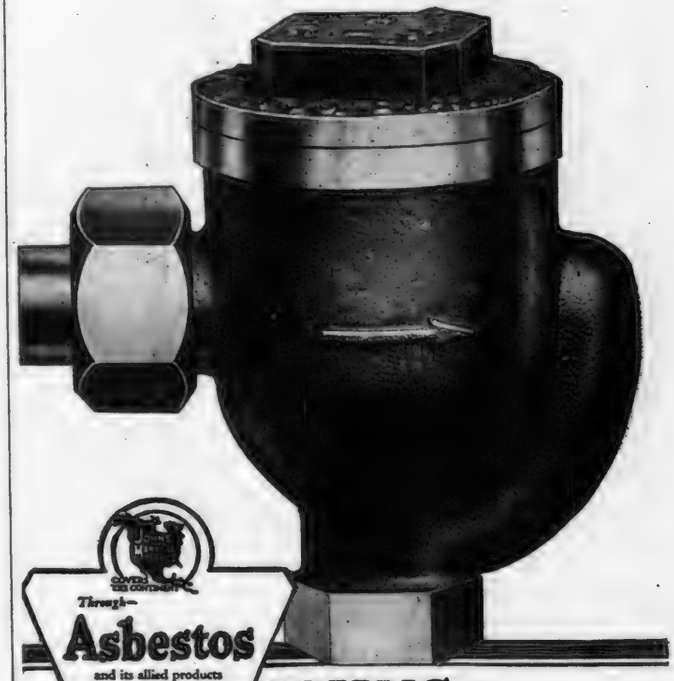
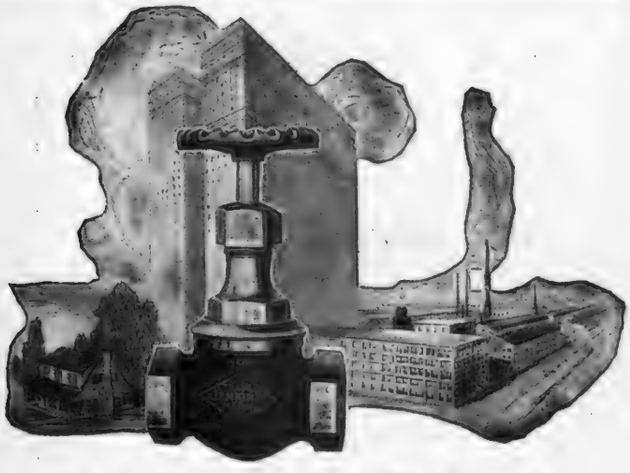




Jenkins Valves are Big Factors in Good Plumbing

A Jenkins Valve is dependable and "trouble-free" under every condition because each valve in every type is made for maximum service, not merely the average—and so tested before it leaves the factory.

Jenkins Valves are made of brass, iron, and steel in types and sizes to meet all requirements of power plant, plumbing, and heating service. They are known by the name and Jenkins "Diamond Mark" cast on the body.

JENKINS BROS.

New York Chicago Philadelphia Pittsburgh
St. Louis Boston San Francisco Washington
Montreal London Havana

2233-J

Jenkins Valves SINCE 1864

Promptly" Day; Sunday, January 23, "Sharewith-Others" Day.

John Ihdler, managing director of the Philadelphia Housing Association, has been chosen manager of the new Civic Development Department of the Chamber of Commerce of the United States. This is one of the new departments into which the activities of the national chamber was recently divided and will cover the problem of housing.

International Chamber of Commerce, now functioning in Paris, will have an American section which will be established in Washington by the United States Chamber of Commerce. Lacey C. Zapf, formerly assistant manager of the research department of the national chamber, has been appointed secretary of the American section.

Building Operations for October, 1920, as reported by the F. W. Dodge Company showed a slump, caused, it was stated, by a prolongation of the period of business uncertainty. Contracts awarded during October in the 25 States comprising the northeastern quarter of the country amounted to $177,791,000, which was 28,000,000 less than the September figure. The decline was general throughout the territory, except in the northwestern States, Minnesota and North and South Dakota, which showed an increase over September. In spite of the relative inactivity of recent months, the total amount of money involved in building operations during the first ten months of this year has amounted to 10% more than the amount for the same period last year. Since January 1, 1919, the country has run one-third of a year behind on its announced construction program. Since there was before 1919 a great shortage of construction, the present deficiency probably amounts to the construction activity of 1½ normal years. It is this deficiency, states the report, that is the outstanding feature of the situation. This accumulated demand for construction has been dammed up by instability of the material and labor market, by tightness of the money market, and by transportation facilities. Just as soon as these conditions are sufficiently improved, it is predicted, the pressure of demand will break through the log-jam and will become the dominating factor, resulting in a great resumption of activity.

Eastern Supply Association, at its recent annual meeting in New York, elected the following officers: President, A. M. Maddock, Thos. Maddock's Sons Co., Trenton; first vice-president, F. W. Hubbard, W. B. Hubbard Sons Co., Boston; second vice-president, Geo. E. Keenan, Bayonne Supply Co., Bayonne; treasurer, Martin Behrer, Behrer & Co., New York, and secretary, Frank S. Hanley, 261 Broadway, New York.

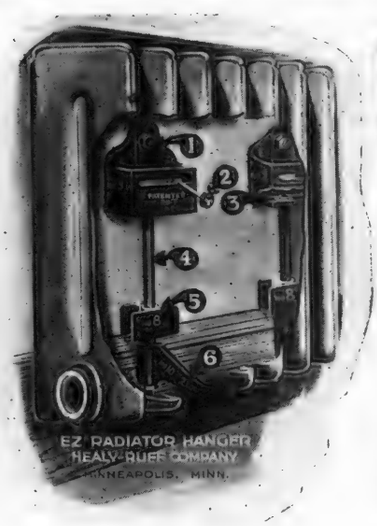
Central Supply Association elected the following new officers at its recent annual meeting in Chicago: President, Alex. B. Pierce, N. O. Nelson Mfg. Co., St. Louis; first vice-president, E. C. Garrity, National Plumbing & Heating Supply Co., Chicago; second vice-president, E. I. Leighton, Leighton Supply Co. Fort Dodge Iowa; treasurer E. F. Niedecken Hoffman & Billings Mfg. Co. Milwaukee; secretary, Paul Blatchford, 139 N. Clark St., Chicago.

New York.—Evidence brought out by the Lockwood Housing Committee of the New York legislature, that there has been collusion in the bidding of certain sub-contractors on public building work, has caused a statement to be issued by Comptroller Craig that a special investigation will be undertaken by the city with special reference to sub-contracts for heating, ventilating, plumbing and limestone work on schools and other city buildings. It was brought out in the evidence before the Lockwood Committee that a number of heating, plumbing and stone-cutting concerns were subscribers to a "Code of Practice," under the direction of their attorney, John Hettrick by which it was possible to control all bids submitted and to distribute the work according to plan.

New York.—With the steam heating plants in 130 public school buildings in need of repairs on the eve of the winter, the Board of Education has made available $200,000 for immediate repair work. Considerable criticism was expressed by the Board of Estimate that the conditions reported had not been discovered earlier. The necessary money was taken from the fund created by the 1920 budget amounting to $2,000,000 for "foreseen" repairs.

Central Station Heating Notes.

Peoria, Ill.—New increased rates for



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1. One Bolt.
2. Invisible Washer.
3. Horizontal Adjustment.
4. ½-inch Pipe.
5. Adjustable for Baseboard.
6. Made for Wall, 1, 2, 3, 4, 5-Column, and Window Radiation.

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HEALY-RUFF CO.

502 Plymouth Bldg. Minneapolis, Minn.

"Genuine Detroit" Packless Radiator Valves

Detroit Packless Radiator Valves are the result of years of experience in the valve manufacturing field—of a careful study of valve needs—of painstaking care on the part of our engineers.

So well do these valves qualify for efficient service—for handsome design and pleasing appearance—for complete satisfaction, that leading architects, heating engineers and master builders, the country over, recommend and specify them for jobs that require the most careful consideration.

They are made for steam, vapor and vacuum heating systems—in all necessary sizes and a variety of styles. Let us send booklet giving full information.

DETROIT LUBRICATOR COMPANY.
DETROIT, U.S.A.

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

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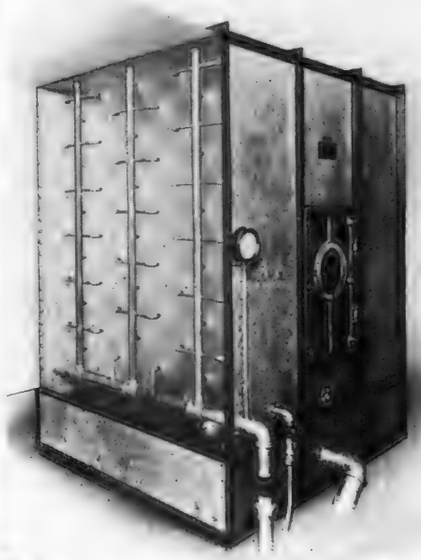
AIR WASHERS



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SPRACO PRODUCTS

SPRAY ENGINEERING CO.,
BOSTON, MASS., U. S. A.

steam heating service have been granted the Central Illinois Light Company and will be effective in both Peoria and Pekin. In Peoria the rate for the first 4,000 lbs. of condensation remains the same at $1.50. The big advance is in the rate per 100 lbs. condensation over 4,000 lbs. and up to 104,000. This rate has been increased from 50 cents to 70 cents. Above 104,000 lbs. and up to 304,000 lbs., the new rate is 60 cents. Over 304,000 lbs. the rate is 55 cents. The minimum charge for meter is made $40.00 for the season. It was formerly 5.00 per month. As under the old rate bills are payable monthly and a discount of 10% is allowed if paid within ten days. In Pekin the rates will be $1.50 for the first 1,000 lbs. ;70 cents for the next 100,000 lbs.; 65 cents for the next 200,000; and 60 cents for all over 304,000 lbs. The minimum bill, it is provided, will be $20.00 a season. The 10% discount for prompt payment is also effective in Pekin.

Mt. Carmel, Ill.—The Mt. Carmel Heating Company has appealed from the decision of the State public utilities commission which ruled that the company should continue heating service at rates which the representatives of the company declare to be unprofitable. The attorneys claim that an increase in rates is the only solution of the heating problem in Mt. Carmel. Some time ago the company applied to the commission for permission to abandon the heating service in Mt. Carmel. The order, from which the company is now appealing, directed the company to furnish heat to its patrons and to begin immediately to put the heating plant in repair and to complete this work within 30 days.

Newark, N. J.—The referendum on the erection and operation of a municipally-owned and operated heat, light and power plant for Newark carried at the recent election by a vote of 38,810 to 34,165 against. The proposal was bitterly opposed by the Chamber of Commerce. The proposal to have a municipal power plant was first introduced ten years ago by Mayor Charles P. Gillen, then a member of the Board of Works, who introduced a resolution which was not acted upon favorably. The board was finally induced to put the measure on the ballot this year. Thomas L. Raymond, commissioner of public works, is expected to have plans drawn for the proposed plant. It has been suggested that the city derive some of its power from the watershed near Pompton.

Billings, Mont.—According to an agreement between representatives of the Billings Utility Company and city officials, heat is to be furnished immediately to the city buildings, including the public library. The agreement provides that the city shall pay current bills for heat submitted by the utility company under protest, pending decision in court on the city's appeal from the public service commission's decree ordering municipalities to pay for their heat. It is provided in the contract that in the event of a decision favoring the city, the utility company will refund the money paid by the city.

National District Heating Association, through Secretary D. L. Gaskill, reports that conditions with central heating companies are somewhat better than they were last year and the year before in that rates are being raised to meet cost conditions. The Educational Committee of the association has the forthcoming Hand Book of central heating data well advanced. About two-thirds of the advertising space in the hand-book has been contracted for, and with the sale of the balance the work of publishing the hand-book will go forward rapidly.

Manufacturers' Notes.

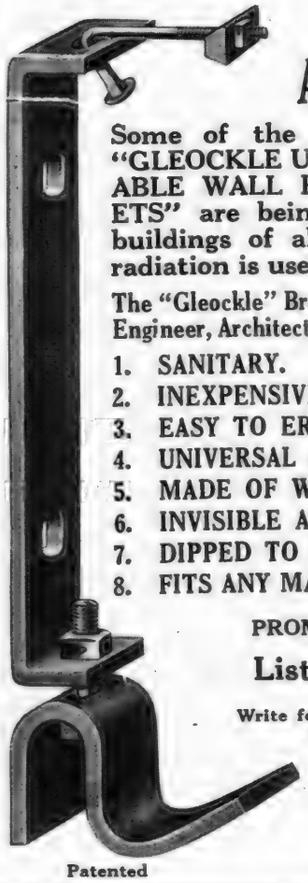
Michigan Lubricator Co., Detroit, Mich., has increased its capital from $200,000 to $1,000,000.

Illinois Malleable Iron Co., Chicago, Ill., is building a $7,000 one-story building, 40 x 75 ft. at 2926 North Paulina street.

Narowetz Heating & Ventilating Co., Chicago, Ill., has purchased a lot at 1711-1717 Park Avenue on which the company will build a two-story factory and office building, to cost $40,000. Alfred S. Alschuler is the architect.

Walworth Mfg. Co., Boston, Mass., has appointed W. S. Iverson as office manager of its New York branch. His territory, which includes New Hampshire, Vermont and the Province of Quebec, has been taken over by Philip L. Johnson.

Westinghouse Electric & Mfg. Co.'s



MANY ADVANTAGES

Some of the many reasons the "GLEOCKLE UNIVERSAL ADJUSTABLE WALL RADIATOR BRACKETS" are being used in the best buildings of all kinds where wall radiation is used for heating.

The "Gleockle" Bracket satisfies the Owner, Engineer, Architect, Contractor and Mechanic

1. SANITARY.
2. INEXPENSIVE.
3. EASY TO ERECT.
4. UNIVERSAL ADJUSTMENT.
5. MADE OF WROUGHT IRON.
6. INVISIBLE AFTER ERECTION.
7. DIPPED TO PREVENT RUSTING.
8. FITS ANY MAKE WALL RADIATOR.

PROMPT SHIPMENTS

List Price, $2.50

Write for our new booklet and trade discounts

MANUFACTURED AND SOLD BY

A. F. GLEOCKLE, Jr.
415 Bay St.
ROCHESTER, N. Y.

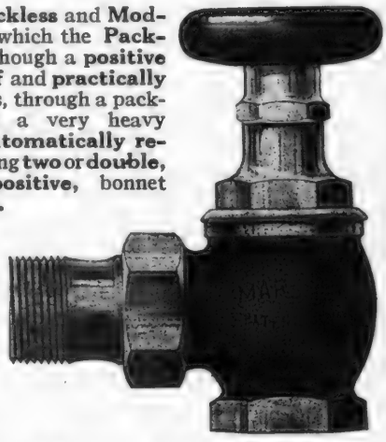
Patented

MARSH
RE-ENFORCED
PACKLESS
VALVES

Quick Opening

Note General Lines Carefully

The **ONLY Packless** and **Modulated** Valves in which the **Packless Feature,** although a **positive seal within itself** and **practically indestructible,** is, through a packing cushion and a very heavy special spring, **automatically re-enforced,** providing **two or double, independent, positive,** bonnet seals at **all times.**



These valves will withstand high pressures and, therefore, are of **superior value** for **vacuum** and **low pressure service.**

We specialize on high grade Radiator Valves and furnish the largest line of any company in the business

Printed matter and prices on application

MARSH VALVE CO., Erie, Pa.

This department store veteran installation furnishes the R. H. Macy & Co. store with an unfailing supply of purified air.

EIGHTEEN YEARS OF SERVICE

"Sirocco"
TRADE MARK

IN 1902, R. H. Macy & Co., of New York felt the need of adequate ventilating equipment, and installed a complete "Sirocco" Ventilating System.

Today, after 18 years of steady use, this "ABC" Installation is giving the same kind of satisfactory service as it did at first. This continuous performance is duplicated in many other places where "Sirocco" Products are in use.

It is no light task that the ventilating equipment is called upon to perform in such a mammoth department store. It must not fail to accomplish its work because the functions of the entire business depend to a surprising extent upon the circulation of fresh, clean air throughout the store.

R. H. Macy & Co. Department Store, New York City

AMERICAN BLOWER COMPANY
DETROIT, MICHIGAN

South Philadelphia plant was illustrated in the photogravure section of the *Philadelphia Public Ledger* for Sunday, October 24, in the series being published on "Great Industries That Have Made Philadelphia Great." The illustrations occupy two full pages of the *Ledger* and include photographs of the late George Westinghouse and of H. T. Herr, vice-president in charge of the South Philadelphia works.

International Heater Co., Utica, N. Y., has opened its new Economy plant, which was purchased by the company several months ago and which was formerly known as the Utica Pipe Foundry plant. The property consists of 40 acres of ground space, together with buildings, railroad sidings, just south of the Erie Canal and a little east of the company's main plant. The buildings of Factory No. 2 cover about 125,000 sq. ft. of ground floor space. Owing to the fact that it was idle for several years it has required a large expenditure to put the buildings into working condition. The first building to be put in shape is the large moulding room containing 30,000 sq. ft. of floor space. The New York Central Railroad sidings extending through the property greatly facilitate the handling of all raw material, as well as the finished product. When the plant is fully equipped and manned, the company states that its manufacturing capacity will be more than doubled.

Fowler & Wolfe Mfg. Co., Philadelphia, Pa., manufacturers of wall radiators, announces that it is now located in the Bulletin Building, with offices in Room 512.

New Economy Plant of International Heater Co., Utica, N. Y.

New Incorporations.

Wisconsin Boiler & Heater Co., Milwaukee, Wis., capital $25,000, to manufacture water heating boilers. Among the principals are Joseph Antonuccio, designer and patentee, Harry M. Wink and John C. Hensey.

Republic Boiler & Radiator Co., Baltimore, Md., capital $1,000,000, to manufacture steam and water boilers and heating equipment. Incorporators: E. McClure Rouzer, Enos E. Stockbridge and William Lentz.

Kezer & Stoddard Co., Portland, Me., capital $10,000, to manufacture heating and plumbing goods. President, Eugene R. Stoddard; treasurer, Abner A. Kezer; secretary, John H. Hill, all of Portland.

Universal Heating Co., Dallas, Texas, capital $15,000. Incorporators: E. C. Barnes, C. C. King, and C. S. Hopkins.

A. B. C. Plumbing & Heating Co., Tulsa, Okla., capital $10,000. Incorporators: H. E. Briwn, D. M. Love and G. E. Warren.

From One Menace to Another

Frequently in seeking to better the ventilation of a plant, equipment is used where the motor is in the duct, directly in the path of the fumes and vapors being expelled. This means an ever-present danger of fire, because of the liability of the motor to spark and ignite the fumes.

When You Install
THE WING-SCRUPLEX EXHAUSTER
REG. U.S. PAT. OFF.

you can assure your customer of perfect freedom from this menace. The motor is entirely outside the duct and does not come in contact with the gases being exhausted, and therefore it cannot cause fire. At the same time it is always cool and clean, and as it is not affected by the heated air passing through the duct, the insulation of the motor will not break down.

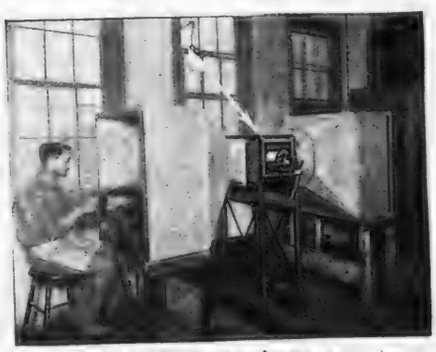
WING SCRUPLEX FANS and EXHAUSTERS are built in a complete range of sizes to fill every possible ventilating requirement.

BULLETIN No. 58-A will solve many of your problems.

Send for a copy today.

L. J. Wing Mfg. Co.

Fans and Blowers (all types) | **Hudson and 13th Streets NEW YORK CITY** | **Damper Regulators Small Turbines**



The above cut shows a WING SCRUPLEX EXHAUSTER in use in a Paint Spray Booth

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

FRESH AIR

is industrial health insurance

Before making your recommendations for Heating and Ventilating apparatus, consider Buffalo.

Let our engineering department help you with your problem. Their vast fund of practical knowledge is at your disposal.

Write Dept. 36 for our catalog—it is replete with valuable engineering data and table.

BUFFALO FORGE COMPANY
BUFFALO, N. Y.

"Buffalo"

New Firms and Business Changes.

Cleveland Heating & Plumbing Supply Co., Cleveland, O., has been organized by Charles S. Rivitz, for the past eleven years connected with the Hiram Rivitz Company, of that city, and M. Edelman. Quarters have been taken at 1705 East 55th Street, where the company will have its showroom and warehouse.

United Electric Co., Canton, O., manufacturers of vacuum cleaning apparatus, announces an increase in its capital stock from $50,000 to $1,000,000.

Cochran-Sargent Co., St. Paul, Minn., jobbers in heating and plumbing supplies, has entered into an arrangement with the Western Supply Co., of St. Paul, whereby the two companies will be consolidated January 1. The Western Supply Company will take care of its own accounts receivable and payable, while the Cochran-Sargent Company will take over on January 1 the merchandise and building of the Western Supply Company, and will carry on the consolidated business under the name of the Cochran-Sargent Company at Fifth and Sibley streets. The present owners of the Western Supply Company will retire from active management and the consolidated business will be directed by the present management of the Cochran-Sargent Company.

Contracts Awarded.

Hayes Bros., Indianapolis, Ind., heating West Side School, Indianapolis, for $50,888; the plumbing contract went to Freyn of Indianapolis, at his bid of $33,000.

The "Home Beautiful" Exposition.

Correct ventilation means health in the home; a perfect heating system assures comfort; and a combination of the two helps make the house a satisfactory place in which to live. Both these essential factors for the better housing of the family will find place in the long array of exhibits at the "Home Beautiful" exposition, to be held in Mechanics Building, Boston, from April 16 to 30, 1921. As heating is a vital matter at present on account of the high price of fuel, there is every reason to predict that this particular feature of the exposition will attract many persons.

This show will be the first of its kind to be held in this country and will contain exhibits from every large manufacturer whose product has direct connection with the home, inside or out. The general plan is to educate the public along the lines of efficiency and economy, and all types of labor-saving and time-saving devices will have a leading part in the exhibits.

The hall, one of the best arranged in the United States for exhibition purposes, will be tastily decorated by experts, with a view to presenting various color schemes for the benefit of all who are interested. Four orchestras will play during both day and evening, and every indication now points to a most successful display of everything relating to "the home beautiful."

Working under the personal direction of Chester I. Campbell, the management of the exposition, has made such extensive plans that not one thing of essential value in or about the home, has been overlooked. The fact that Mr. Campbell has managed, during the last twenty years, all the big exhibitions that have come to Boston—the Automobile show, National Textile Exhibition, Shoe and Leather Show, and the Flower show—is evidence that the Home Beautiful Expositon will carry a vital personal appeal to all.

The exhibit of appliances used in the home will be most comprehensive, and the list of exhibitors include firms of national standing, as well as many local houses. Their displays alone will occupy 125,000 sq. ft. of floor space. A conservative estimate of the attendance allows for an average of 25,000 each day, but the management is prepared for a larger number because this will be the first ex- of everyday life in the home.

SERI-VANE FANS

are conservatively rated, giving that dependable assurance which means so much to careful Engineers, Contractors and Owners. You will find the same care is exercised in the manufacture of the product itself as is used in the compilation of the capacity tables.
When you want Fan satisfaction, specify

SERI-VANE FANS

THE NEW YORK BLOWER COMPANY
513 Transportation Building
CHICAGO
Factory: LaPorte, Indiana
Branch Offices in all large cities

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

Municipal Building, New York

McKim, Mead & White, Architects
Equipped with 17 Massachusetts Fans

MASSACHUSETTS FANS

THE selection of Massachusetts Fans for this tremendous office building, housing thousands of workers and demanding the utmost efficiency in ventilation, is another striking example of the esteem in which experienced architects hold this equipment.

Seventeen Massachusetts Fans are installed in the Municipal Building, including:

10 Multi-blade or Squirrel Cage Fans driven by 204 h. p. and moving 276,000 cubic feet per minute.

6 Propeller Fans driven by 46 h. p. and moving 164,000 cubic feet per minute.

1 Centrifugal Steel Plated Fan driven by 10 by 12 engine.

Total Pressure 162,000 cubic feet per minute.

Total amount exhausted 278,000 cubic feet per minute.

All over the country are to be found other notable buildings equipped with Massachusetts Fans.

May we send you a list of leading installations and a copy of our Condensed Bulletin of Fans, Blowers and Heaters?

MASSACHUSETTS BLOWER COMPANY

Watertown, Mass.

Branches in All the Principal Cities

Money prizes to be distributed in competitions will total more than $1000. The first award of $100 is for the best plan for a house of not less than six rooms, to cost not more than $7,500 above the land. Other awards are to be made for the best layout of interior decoration for the house, for a model kitchen, a model bathroom, a model laundry and a model playroom. A secondary award will be made in each department, and in addition $50 will be given to the person who designs the best poster for the exposition.

The greatest single feature of the exposition will be an actual model house, of the design accepted as the winner in the contest. This house will be completely furnished, and will embody the best designs for decoration, kitchen, laundry, bathroom, playroom, etc. It will give a clear idea of the general exhibits of the exposition, inasmuch as it will include electrical and gas appliances, hardware, paints, flowers, heating apparatus, home furnishings, and all materials used in building the home complete.

WANTED

Advertisements under this heading, $2.00 per inch, payable in advance. A 1-in. advertisement contains 35 words. To secure insertion copy must be received not later than the 20th of the month preceding date of issue.

POSITION WANTED.—A first-class engineer of fifty, with practical, technical, executive and business training in the design, manufacture, sale and installation of steam power, heating and ventilating apparatus and appliances, desires a position as manager, superintendent or sales engineer. Now employed; at liberty after January 1. Address Morton, care of HEATING AND VENTILATING MAGAZINE.

Wanted—High-grade heating and ventilating engineer, who has had experience with both large and small work, especially schools, institutional buildings, office buildings, etc., Address Charles L. Pillsbury Co., 805-81 Metropolitan Life Building, Minneapolis, Minn.

WANTED
MANUFACTURER'S AGENTS

to handle the sale of a high grade line of Domestic and Industrial Water Heaters of which there are many installed in shops, factories, public buildings, hotels, hospitals and homes.

Only experienced and well established agents will be considered.

THERMAL APPLIANCE CO., Inc.
Grand Central Palace
125 East 46th Street New York, N. Y.

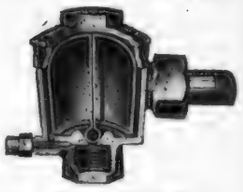
PECO
"The System with a Record"

Over thirty plants "Pecoized" for one company

20% to 40% fuel saving

Let us talk over your condition with you

The Fool-Proof Valve



Non-adjustable
Positive in action

Catolog on request

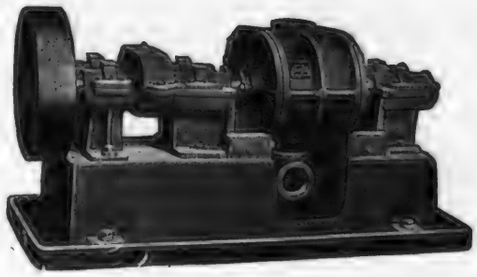
PITTSBURGH ENGINEERING CO.
Mfrs. Peco Vacuum System of Steam Heating and Drying
JEANNETTE PENNSYLVANIA

LEHIGH

The patented construction of the "Lehigh" Multiblade Fan Wheel produces remarkable capacities.

The new Lehigh Data Book and catalog is of unusual interest to every engineer. In addition to multiblade fans, it treats of steel plate, planing mill exhaust, and other fan types, air washers, dust collectors, roof and mushroom ventilators, etc. The engineering data is particularly interesting. Write for your copy.

HERSH BROTHERS COMPANY
655 Mill Street
ALLENTOWN, PENNA.



That New Apartment House

—are you going to figure on the heating system? Before you do, get a copy of bulletin 12H and prices on the Connersville Rotary Vacuum Pump.

The Connersville Blower Company

Connersville Indiana U.S.A.

Chicago, 1431 Monadnock Block New York, 114 Liberty Street

Marsh Reflux Junior Thermostatic Traps

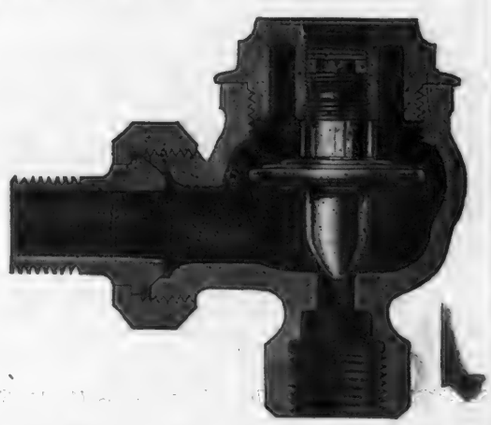
For Radiators and Coils of "Low Pressure," "Vapor" and "Vacuum Heating Systems"

FREELY DISCHARGES AIR AND WATER WITHOUT LOSS OF STEAM

THE Marsh REFLUX Return Line Trap is for use on the return end of radiators of low pressure, vapor or vacuum systems of heating. It is the result of a careful investigation into the actual requirements that must be fulfilled by a radiator return valve, in order that it may accomplish what is desired of it, namely, to **free the radiator of air and water without the loss of steam** and to do so **noiselessly.**

The Marsh Reflux Junior Thermostatic Trap is recommended for small radiators and coils. This Trap for the small and the Original Reflux for the large units will make an ideal job. Especially adaptable for two pipe gravity work and vapor systems.

May be furnished either sealed adjustment (as illustrated) or with outside adjustment.



Write for literature fully describing this Trap

JAS. P. MARSH & CO., 118-124 South Clinton Street, Chicago

Founded 1865

Manufacturers of Gauges for all Pressures **Automatic Air Valves and Steam Specialties**

Agents for Great Britain and Ireland: Chatterton & Co., 30 Fetter Lane, E. C. 4, London
Agents for Dominion of Canada: Taylor-Forbes Co., Ltd., Guelph, Ontario

Salt Water Condensing

Service Measured by Centuries

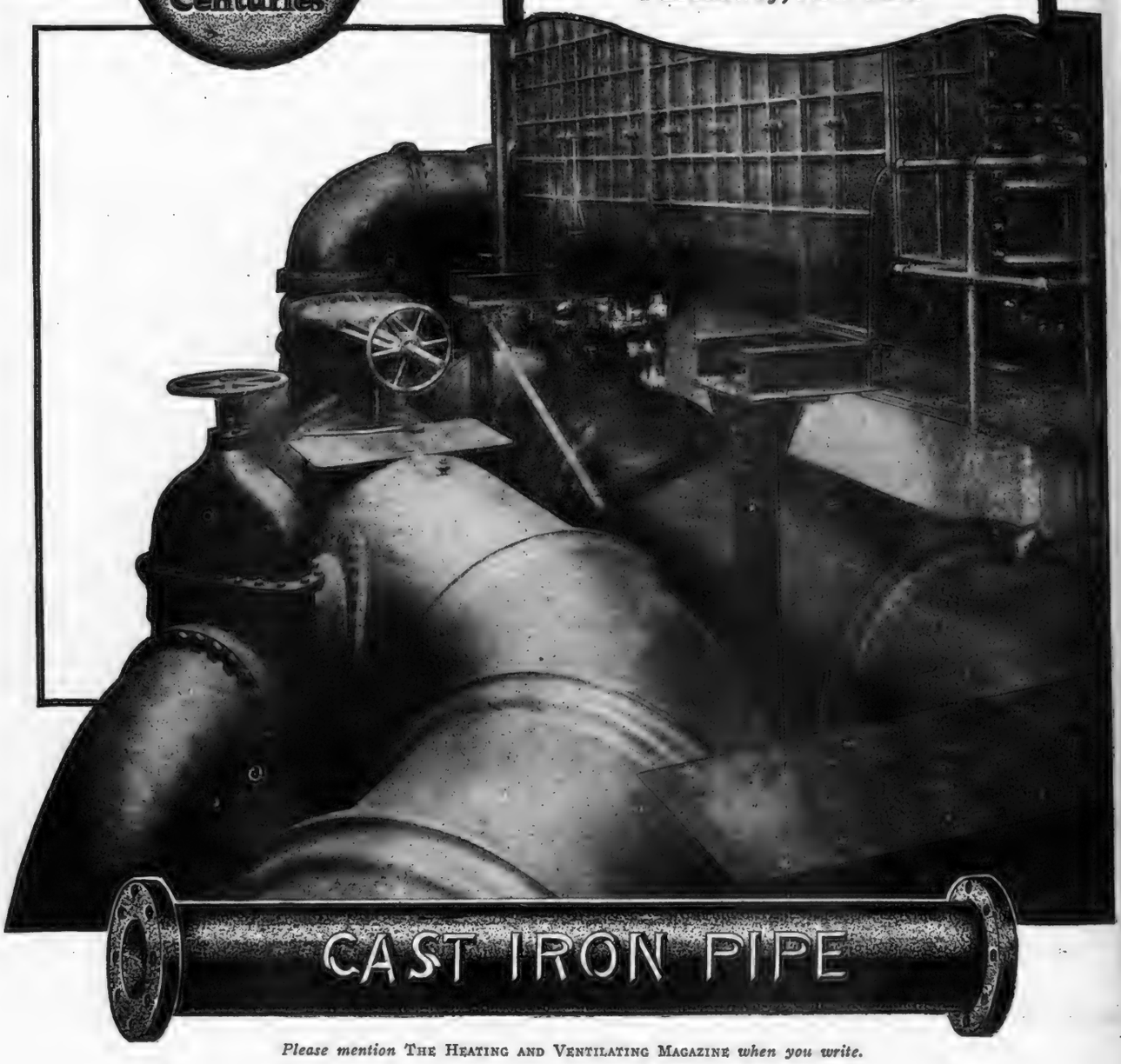
NEARLY all large power plants in seaboard cities use salt water for condensing purposes, and the pipe handling this water is invariably of cast iron.

Here are two lines of 60-inch cast iron pipe, with 42-inch condenser connections at Station A, Pacific Gas & Electric Co., San Francisco, Cal. Total length of these two lines, inflow and outflow, is 600 feet. The system was installed 17 years ago and its present condition is apparently perfect.

Booklet—"Cast Iron Pipe in Industrial Service"—sent on request

The CAST IRON PIPE PUBLICITY BUREAU

1 Broadway, New York



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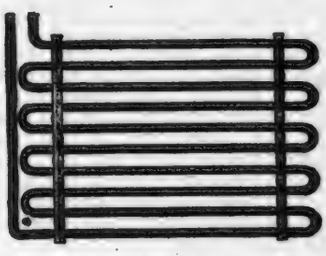
JOHN SIMMONS CO

110 Center Street, New York

PIPE COILS and BENDS

CORNER HEADER COIL

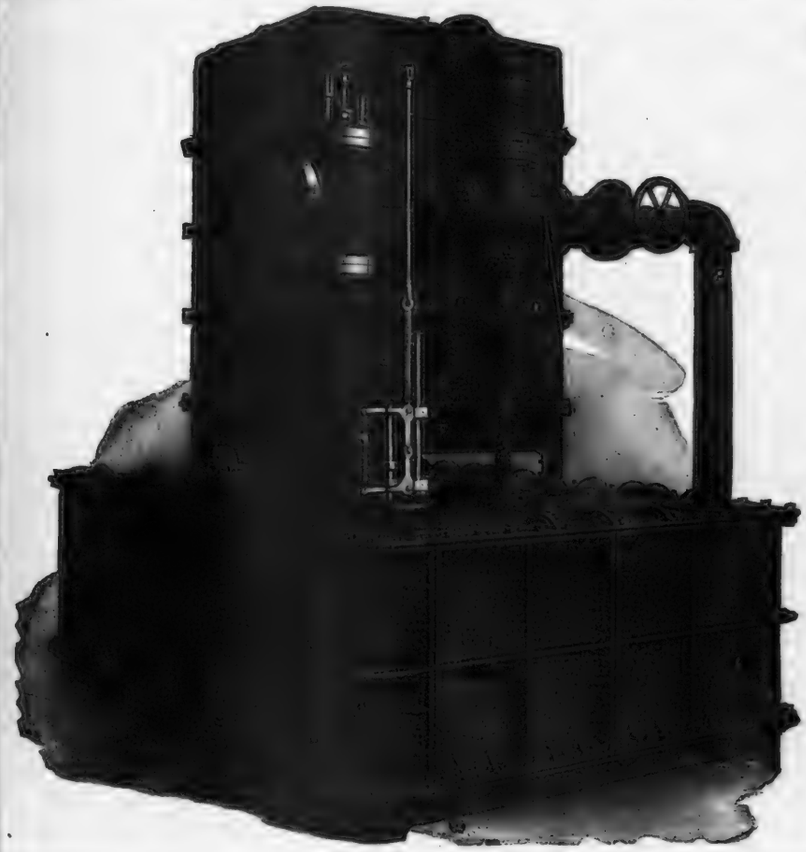
PLAIN SPIRAL COIL



ZIGZAG COIL

We bend up to 16" and weld. Van Stone up to 36" Pipe. No job too difficult. First-class material and workmanship. We are specialists in this line and solicit a trial on your requirements. Prompt service.

Send Today for Our Coil Folder



"Hammond"

Storage Type Water Meters

Unfailing accuracy at any rate of flow.

Offered for metering condensate, boiler feed supply or make-up water.

Full description is given in Bulletin No. 20, sent on request.

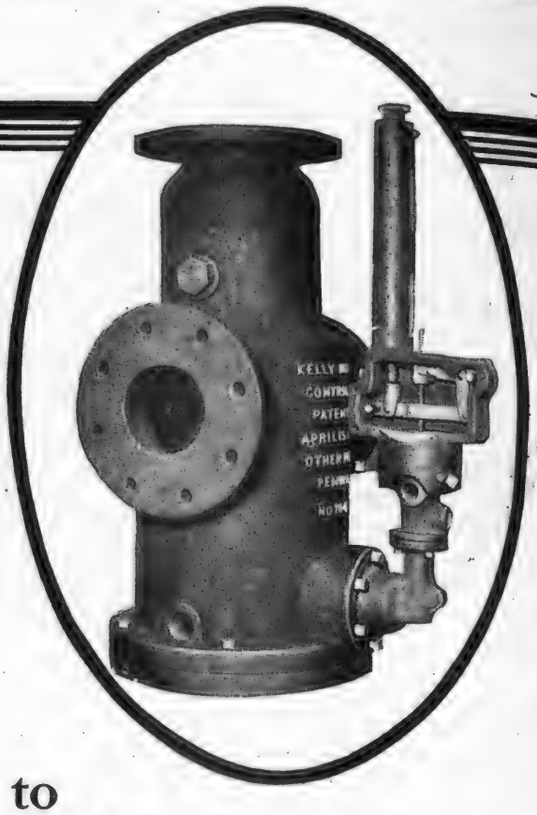
ALBERGER PUMP & CONDENSER COMPANY

140 Cedar Street

NEW YORK CITY

Boston Chicago St. Louis Philadelphia

The Final Touch to the Heating System



Install the Kelly Controller to Prevent Explosions and Cracked Sections

The Kelly Controller is the perfected result of years of effort to produce a simpe, fool-proof device which will unfailingly and automatically correct every faulty condition that can develop in heating boilers—even when the heating system falls into the hands of the most unskilled operator.

It immediately meets impending dangers and forestalls accidents, restoring the boiler to normal operation.

When a slight surging condition occurs, the water which threatens to foam over into the system is deflected into the controller chamber and returned to the boiler through a bleeder pipe.

If ordinary steam separation is inadequate, an automatic water valve supplies the boiler with just enough feed water to reduce the temperature of the overheated surging water and correct the condition.

If, through carelessness or ignorance, the attendant continues to fire the overheated boiler, the controller goes a step farther and completely cuts off the boiler from the system, at the same time gradually reducing the water temperature. Since syphoning is impossible, explosions are absolutely prevented. Controller takes the place of the steam header and is just as easily installed.

Accorded the Fairbanks "O. K."

After rigid tests covering every condition that can arise in actual service, the Kelly Controller has received that well-known stamp of proven merit—The Fairbanks Company "O. K."

Stock carried by following branches

ALBANY	DETROIT	PROVIDENCE
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BOSTON	NEW YORK	SYRACUSE
BUFFALO	PATERSON	UTICA
CHICAGO	PHILADELPHIA	WASHINGTON
CLEVELAND	PITTSBURGH	

Manufactured by the Kelly Controller Co.
195 W. Jackson Blvd., Chicago

and distributed exclusively by

THE FAIRBANKS COMPANY
Administrative Offices, New York

Branches listed opposite

Kelly Controller

"The Boiler Master"

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

SHUR-TITE

SHUR-TITE is the best and most convenient Boiler Repair Cement on the market.

Pour into the boiler, start the fire, and it works while you are gathering up your tools.

SHUR-TITE should be kept in stock ready for use when the calls come in this fall for boiler repair jobs.

Don't be afraid of SHUR-TITE spoiling in stock. It is a **powder** and can not evaporate, deteriorate or waste.

Your jobber carries SHUR-TITE in stock—write him.

Being a Powder—

it Cannot Deteriorate!

The Sure Cure For Leaky Boilers

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

The Nokol Dealer Is "The Man of the Hour"

How to heat the home?—is one of the problems confronting the American public today. And, because Nokol supplies the answer—Nokol dealers are money-makers. ***The opportunity is still open to some men***

In every business era there is at least one new industry that makes big money for the men who have the foresight to get in early enough. Witness the automobile, the tractor, the moving picture, the farm lighting plant.

The burning of oil instead of coal for home heating is creating such an industry, such a money-making opportunity for the right type of men—right now.

Heat is fundamental—warmth is essential. And Nokol supplies a *better way* to heat the home.

Nokol automatic oil heating for the home eliminates the "coal problem"; *eliminates the need of human attention.* No going down to fix the furnace morning and night; no coal to shovel; no ashes; no soot. By means of an electric thermostat the same even, healthy temperature is maintained all the time.

Thousands of home owners all over the country have supplanted the drudgery, the dirt, the *uneven temperature* of coal burning with the luxury of this "press-a-button" heating service.

Every home owner in the United States is a potential Nokol owner. And, from every indication the building of new homes during the coming year will be on a large scale.

Nokol fits into any type of furnace. It is tested and approved by the National Board of Underwriters.

* * *

During the past year our problem has been in large degree one of keeping production apace with the demands of our present dealers. Today production is being increased to that point where we will shortly be in a position to place new dealer franchises.

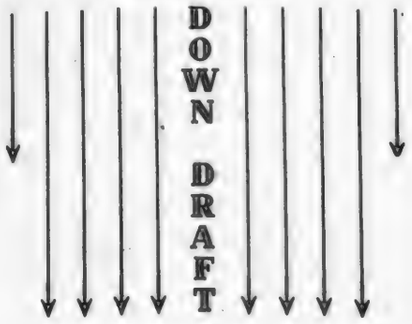
If you are looking for greater opportunity—have merchandising and business ability, and sufficient working capital to operate the right type of showroom and sales force—write or wire for further particulars right now.

THE STEAM CORPORATION, 215 North Michigan Avenue, Chicago
Division of Amalgamated Machinery Corporation

NO COAL NOKOL *automatic oil heating*

IMICO
Heating Boilers

Smokeless



For Water or Steam

Our Catalogue describing our complete line of Heating Apparatus sent on request

Illinois Malleable Iron Co.
Chicago

KING KOAL KARBURETOR SAVES COAL

NO ASH SIFTING

NO COAL GAS

NO ADJUSTMENTS

EASILY ATTACHED
(by drilling small hole)

The "KING KOAL KARBURETOR" WILL give you 25% more heat from your coal.

The "KING KOAL KARBURETOR" WILL increase the efficiency of your heating plant 30 to 40%.

The "KING KOAL KARBURETOR" WILL maintain a gas fire over your coal fire.

The "KING KOAL KARBURETOR" WILL extract all the coal gas from your coal and set it on fire before it reaches the chimney.

The "KING KOAL KARBURETOR" WILL burn all your coal to ashes.

The "KING KOAL KARBURETOR" WILL NOT make a poor draft a good draft.

The "KING KOAL KARBURETOR" WILL NOT make a poor furnace a good furnace.

The "KING KOAL KARBURETOR" WILL NOT make a small boiler grow into a large boiler.

Price $15.00 for Boilers or Furnaces
F. O. B. Phila.

Price $5.00 per set for Ranges or Tank Heaters
F. O. B. Phila.

WRITE FOR BOOKLET OF LABORATORY TESTS

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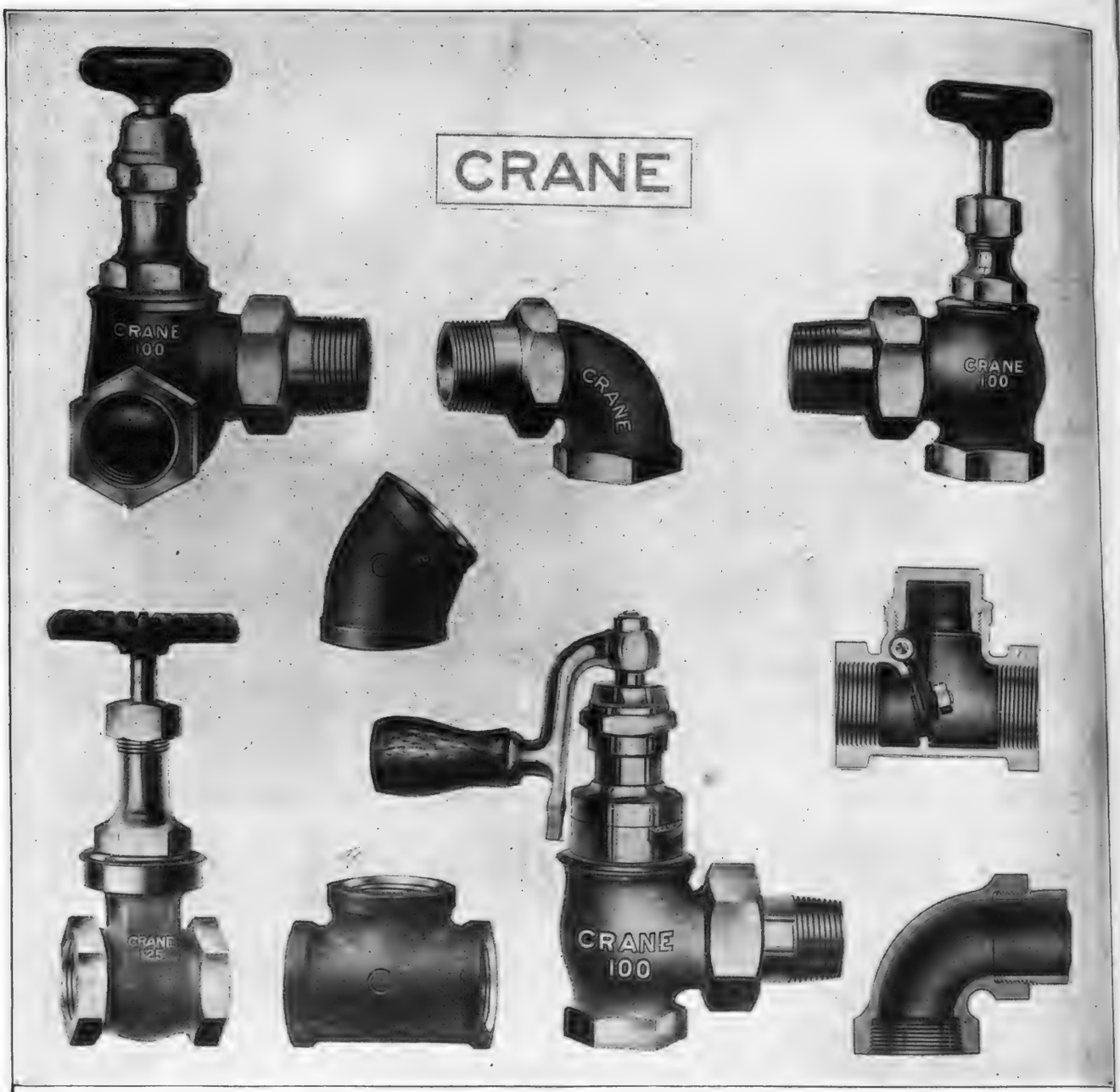
FRED'K SABIN & CO., Inc., 237-239-241 Bread St.
HOWARD MILLER, President PHILADELPHIA, PA.



CRANE VALVES AND FITTINGS FOR HEATING AND VENTILATING

SALES OFFICES, WAREHOUSES AND SHOWROOMS:

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CRANE LIMITED — MONTREAL, TORONTO, VANCOUVER, WINNIPEG, LONDON, ENG., SYDNEY, N. S. W., QUEBEC, HALIFAX, OTTAWA, REGINA, CALGARY.

We are manufacturers of about 20,000 articles, including valves, pipe fittings and steam specialties, made of brass, iron, ferrosteel, cast steel and forged steel, in all sizes, for all pressures and all purposes, and are distributors of pipe, heating and plumbing materials

Please mention THE HEATING AND VENTILATING MAGAZINE *when you write.*

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FOSTER VALVE SPECIALTIES

Foster Class "Q" PRESSURE REGULATOR

is the first choice of leading "heating" contractors for STEAM-HEATING and is also suitable for other low pressure service for delivery pressures not in excess of 15 lbs. High-grade in every way—surely, you want the best.

There are many steam plants in operation today that would be greatly improved from every standpoint if FOSTER VALVES were introduced.

Any appliance that will reduce steam consumption must bring down in proportion the amount of fuel used and correspondingly lessen the cost per horse power.

FOSTER VALVES

Foster Class "G" PRESSURE REGULATOR

is particularly adapted for *intermittent service.* Operates equally well on horizontal or vertical pipe, upright, inverted or inclined at any angle. May be adjusted to deliver from zero to within a fraction the of initial pressure.

Class "QH" PRESSURE REGULATOR

Foster Class "W" PRESSURE REGULATOR

will maintain a **constant pressure** in the delivery pipe where it is desired to obtain a uniform lower pressure of steam, water, gas or air, than the higher (or initial) pressure, regardless of fluctuations in the source of supply.

Class "W" PRESSURE REGULATOR

Our NEW Catalogue No. 40 is just off the press. A copy will be mailed on request. It's worth asking for.

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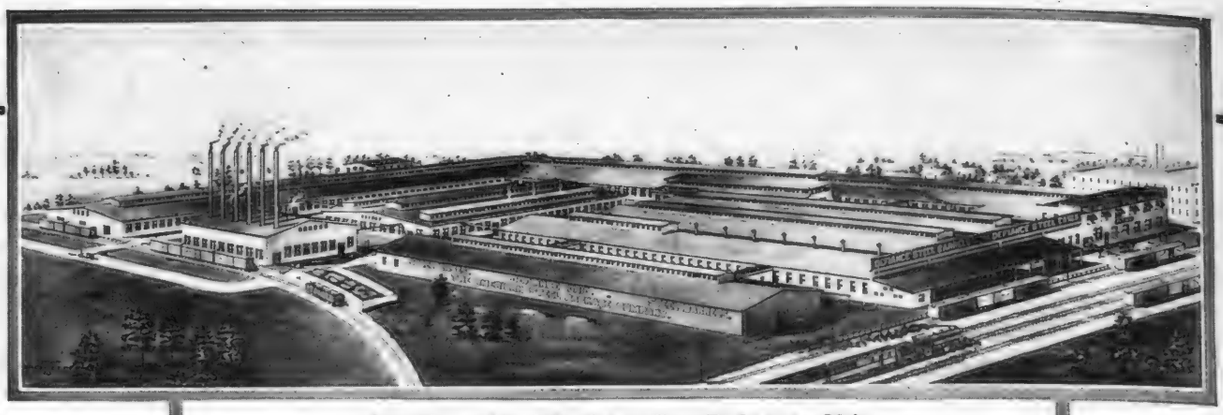
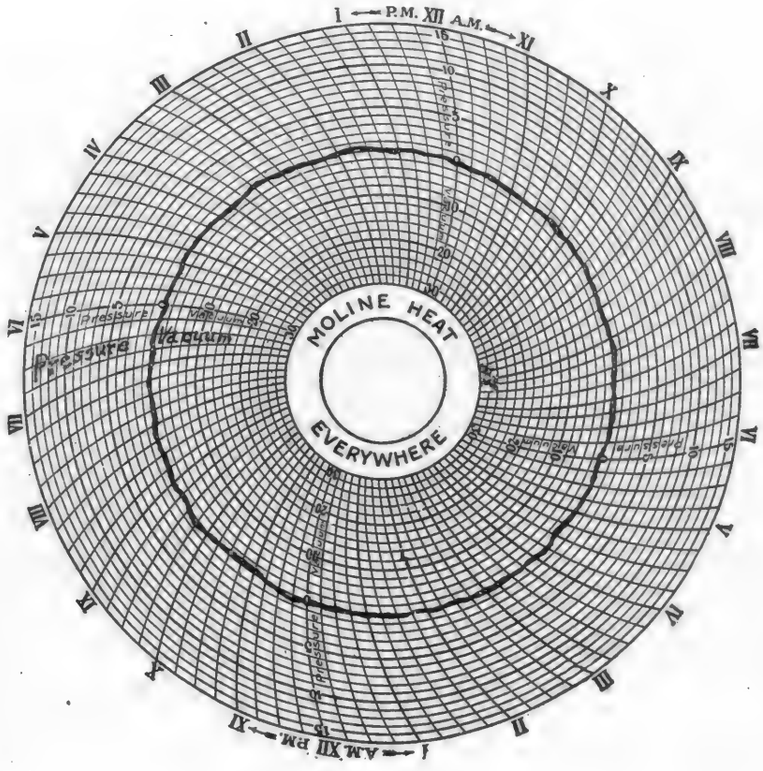


American Steel Package Co., Defiance, Ohio

Carey & Hall, Contractors, Defiance, Ohio



Over 300 Radiators without Automatic Traps. Over 40,000 Square Feet Radiation—No Vacuum Pumps.

Over 40,000 square feet radiation supplied with exhaust steam at pressure shown on chart. Superintendent says he gets either his heat or his power without cost. Over three hundred radiators and coils without traps—no vacuum pumps. Consider the saving in operating and maintenance cost.

Norbury Sanitarium, Jacksonville, Illinois

Jacksonville Plumbing & Heating Co., Heating Contractors

This building is heated by Moline Heat from a boiler plant in a laundry building, separated from this building, without any pump or any automatic traps on the radiators.

SIZE CHARACTER or LOCATION

It Makes No Difference

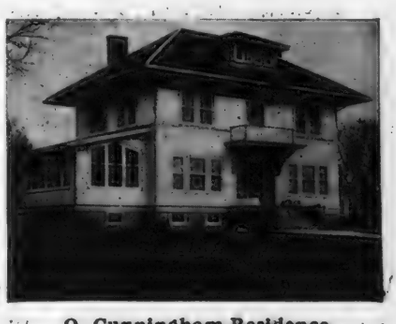
That's one of the reasons why progressive heating contractors prefer to figure on and install Moline Heat. It standardizes their work. It makes their heating business easier to handle and consequently more profitable.

Whether they are in competition with "Hot Air"—"Ordinary Steam"—"Hot Water," or any of those systems with "automatic traps" on the return end of the radiators, their chances are better than ever when they bid on Moline Heat.

Send in the plans for your next prospect and put in a proposal on Moline Heat—and see what happens. You'll never use any other system, once you use Moline Heat. Ask the contractors, who have tried it.
If you haven't read our catalogs, send for them today. Address Dept. F.

J. J. Moeb's Apartments, Washington, District of Columbia
C. L. Wenger, Heating Contractor
460 radiators on this plant, with no automatic traps on them. Moline Heat does the work without any pumps to produce circulation.

MOLINE ILLINOIS



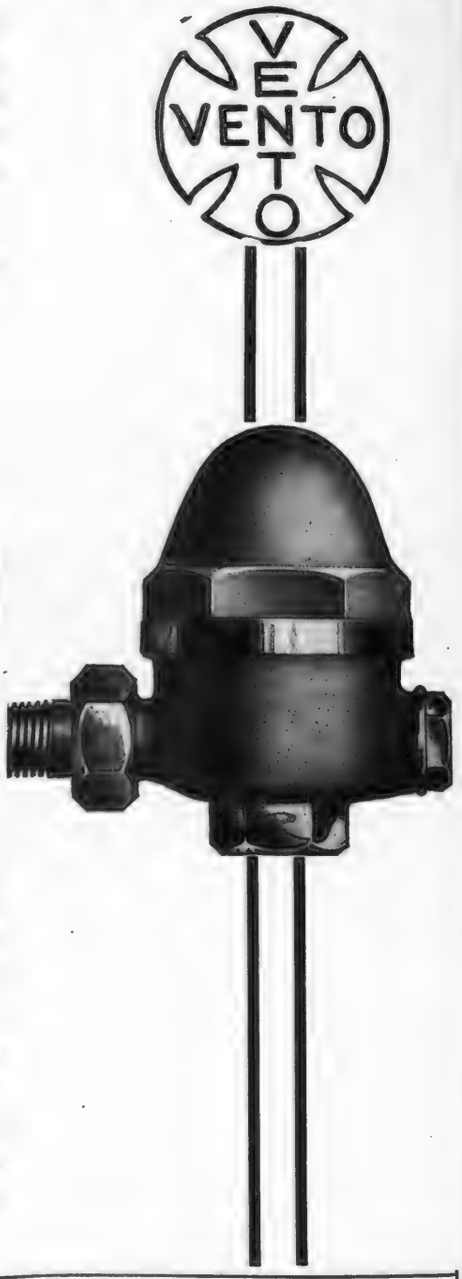
O. Cunningham Residence
Baxter, Iowa
Noah & McCullough, Contractors

HIGHEST HEATING EFFICIENCY

The successful operation of a vacuum or vapor heating system depends largely upon the character of valves with which it is equipped. If steam is permitted to escape to return line, it destroys the vacuum, retards circulation and wastes fuel.

The proper equipment for new installations and the most effective cure for old, unsatisfactory jobs, is the

Haines VENTO Return Line Valve

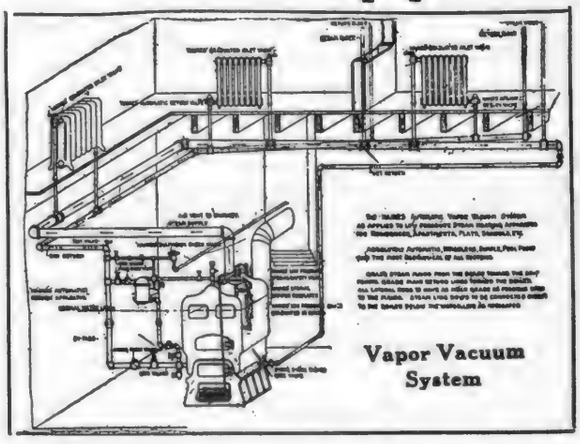


When cold, thermostatic tube is normal and valve has full one-half inch opening. It remains so until all air and condensation have been discharged from radiator. The instant steam arrives, tube expands, closing valve absolutely tight. So constructed that it has a greater movement than similar devices, therefore it can control a valve opening anywhere from two to eight times greater in area. Operates noiselessly. Cannot stick, gum or become inoperative.

Not a Particle of Steam gets Away
Nothing that Ought to Stay in gets out
Nothing that Ought to get out Stays in

The coal-saving feature in itself makes the Haines VENTO valve attractive to the owner of a heating system. Its perfect operation assures efficient heating service.

Let us mail you a copy of Booklet

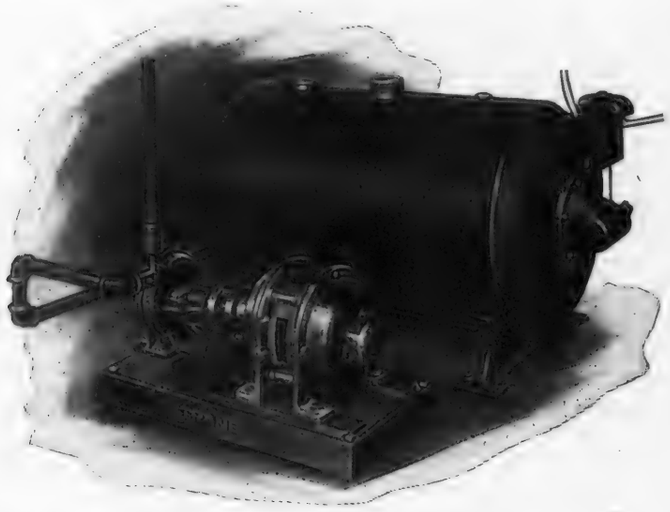


Vapor Vacuum System

William S. Haines & Co.
12th and Buttonwood Sts. Philadelphia, Pa.

TRANE PUMPS

Condensation---Vacuum---Return Line



Electrically driven, direct connected and rotary in type Trane Condensation Pumps possess the unusual and distinct advantage of operating positively against both high and low pressures. Simple and durable in construction, economical and efficient in operation and made and used in a wide range of sizes these remarkable pumps have convincingly proven their exceptional fitness for dependable heating service.

Whatever your requirements, if you have need for Condensation, Boiler Feed, Air Line or Return Line Vacuum Pumps it will pay you to know the Trane line. Send us your pumping problems and we shall be glad to quote you on Trane pumping equipment guaranteed to meet your needs.

Ask for Bulletins and prices.

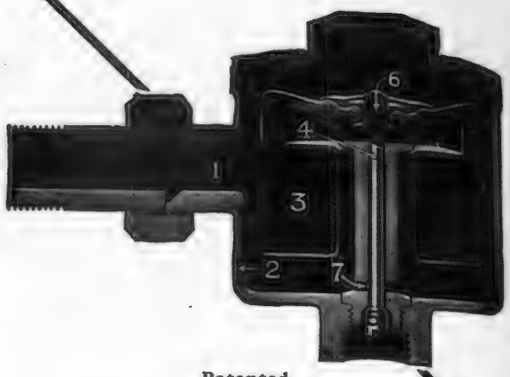
The Trane Company

Established 1883

Factory and General Offices: 206 Cameron Avenue, La Crosse, Wis.

Chicago Office	New York Office	Boston Office	Philadelphia Office
175 Jackson Blvd.	11 John St.	110 State St.	20 S. 7th St.

A Steam Trap that Automatically Eliminates Air and Water Condensation Without Allowing Escape of Steam



Patented

THE McDonald Under-Seat Valve is the only valve of its kind on the market. The principle of operation is positive and noiseless. It gives perfect service on any radiator on a two-pipe heating system and under any ordinary pressure up to ten pounds. Handles and discharges a much larger quantity of water than any other trap or valve of equal size. Self-cleaning. Carries away all scale. Entire inside instantly removable by loosening cap. Saves every ounce of steam. Its economical features are greatly appreciated by the building owner.

Leading architects, heating engineers and contractors are specifying and installing large numbers of the McDonald Under-Seat Valve, because its superior features bave been proven in service.

Write for detailed information

The McDonald Under Seat Valve Co.

602 Swetland Building **CLEVELAND, OHIO**

HOT WATER **LOW PRESSURE**

2" for Hot Water

7" for Low Pressure

10" for Vapor

One for Every Duty

The Best Metallic Boiler Regulator Made

TRADE METAPHRAM MARK REG U.S PAT OFFICE

NATIONAL REGULATOR CO.
FACTORY AND GENERAL OFFICES
208-212 South Jefferson Street
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VAPOR **HIGH PRESSURE**

ADSCO HEATING

Never Wait for Heat

Save 20 to 30% Fuel Cost

WITH radiators and returns drained and vented to the atmosphere at all times, radiators fill with steam instantly and silently. Steam never comes in contact with cold water to cause noise.

The Adsco Graduated Radiator Valve—the only valve on each radiator—absolutely controls the amount of steam used. It admits just enough steam to fill radiator, 1/3, 1/2, 5/8, 3/4—any desired amount as weather conditions require. This effects a saving of a ton of coal in every 3½ to 5 tons you buy.

The extreme simplicity of Adsco heating—no air valves, no return traps, no vacuum pumps, or other complicated devices—means that Adsco heating costs from 15 to 20% less to buy and install than most other systems. It is easy to change over hot water systems to better-controlled, more economical Adsco Heating.

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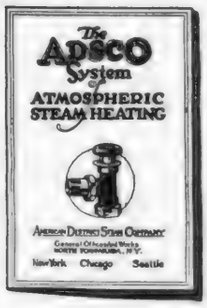
Some Sales Territory Open

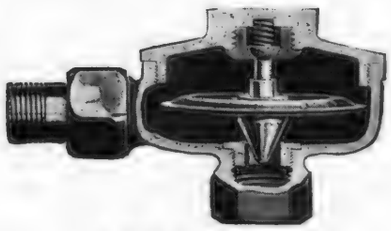
We have an Attractive Proposition for Jobbers



Read Bulletin No. 150-H

For Homes, Offices and Factory Buildings, ask for Bulletin No. 150.

If you are interested in heating a group of buildings, or industrial homes, ask for Catalog H on "Central Station Heating."



B. & B. Vacu Trap

The B & B Line

The Durant Building, Detroit, Mich.

the largest office building in the world, used THE BISHOP & BABCOCK VACU-TRAPS and TEMPERATURE CONTROL SYSTEM.

These have been selected after thoroughly investigating the operation of same in representative installations throughout the country.

In putting on the market The B. & B. Line of Heating Specialties it has been our aim to give the steam user the very best and latest in steam, water and air controlling and regulating valves made. Only the very highest grade of materials and only the very highest type of skilled labor are employed in their manufacture.

Let us send our BULLETINS to you describing The B. & B. Line of Heating Specialties complete.

B. & B. Thermostat

THE BISHOP & BABCOCK COMPANY

General Offices and Factories, CLEVELAND, OHIO.

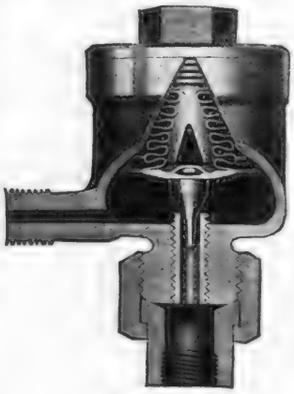
MANUFACTURERS OF

The B. & B. Vacuum Systems.
The B. & B. High and Low Pressure Steam Specialties
The B. & B. Temperature Control
The B. & B. Vacuum Pumps
Miscellaneous Heating Specialties

Announcing an Important Addition to the

SYLPHON LINE

THE No. 410 AIR LINE VALVE



No. 410

Sylphon

AIR LINE VALVE

The Sylphon automatic, non-adjustable, thermostatic air line valve will positively and silently expel air and condensation but close against steam.

It has as its basic principle the well known dependable sylphon—a one-piece, all metal expansible member—which will quickly and effectively distinguish between steam and water or air—allowing the air or water to pass but preventing the passage of steam. This means that every inch of radiating surface becomes 100% efficient.

It is made with either a ¼" or ⅛" male thread on inlet side and a ¼" female thread on outlet union.

Send for Bulletin
ZAVI

SEE OUR CATALOGUE IN SWEET'S

The Fulton Company

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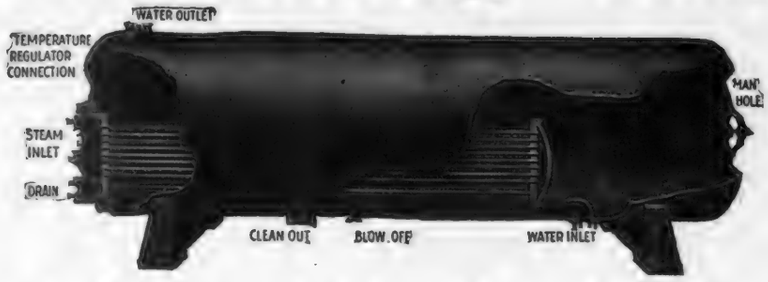
The LARGEST PLANT in the WORLD DEVOTED to the MANUFACTURE of THERMOSTATIC INSTRUMENTS

Russell Storage Heater



The Most Dependable Hot Water Service

For Laundries, Apartment Houses, Hotels, Factories, etc.

7 Reasons Why—

1—Entire tube bundle removable.
2—No U Bends.
3—Straight tube heating surface.
4—Internal floating head permits easy movement of heating surface with changes in temperature.
5—Water inlet directing nozzle accelerates proper circulation and improves heating efficiency.
6—Heaters furnished either riveted ar welded shells.
7—All sizes to meet requirements.

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THE GRISCOM-RUSSELL CO.

2155 West Street Building, New York

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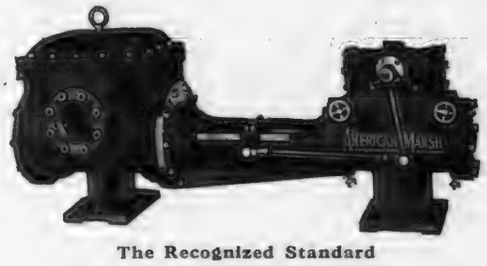
Boston	Cleveland	Minneapolis	Houston	Seattle
Hartford	Toledo	Milwaukee	Fort Worth	Los Angeles
Springfield	Detroit	St. Louis	Charlotte	Kansas City

American-Marsh Pumps

for Heating Systems

For use in returning the condensation to the boiler on heating systems where the steam pressure is too low to operate a steam pump. Water is returned to the boiler in its hottest state. Equipped with an automatic float valve which is positive and reliable.



The Recognized Standard

American-Marsh Vacuum Pumps have been recommended and specified by a majority of the leading heating engineers and Contractors for over twenty years.

Made with only best of material and workmanship. Highest efficiency guaranteed.

Equipped with an improved steam valve which is especially adapted for vacuum service. American-Marsh Pumps are positive in action, possess a perfect governing element and will not hang up under all the varying conditions.

Ask for Bulletins Nos. 24 and 27

AMERICAN STEAM PUMP CO.

Battle Creek, Mich.

Our slogan: Simplex not Duplex. "To be simple is to be great"

MANUFACTURERS!

Reservations Now Being Made For

AMERICA'S FIRST
Home Beautiful Exposition

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Finest Exposition Building in the United States
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and
An Actual House, Completely Furnished

EVERYTHING FOR THE HOME

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The Exposition that will appeal to all
Instructive, Scientific, Beautiful, Entertaining

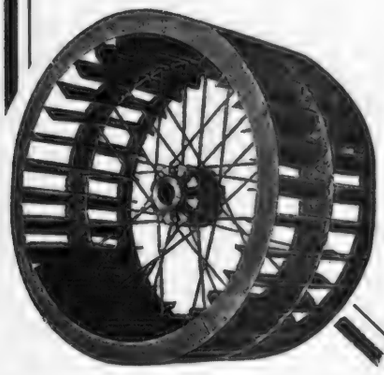
Remember the Date - April 16 to 30, 1921

Under Personal Direction of **Chester I. Campbell**
Executive Office: 5 Park Square, Boston, Mass.

Bayley Plexiform FANS

are furnishing perfect ventilating service in the Salt Lake City Schools shown at the right, and in thousands of other schools, churches and public buildings in all parts of the country.

They were chosen in each instance for their ease of operation, perfect balance and freedom from breakdown troubles.

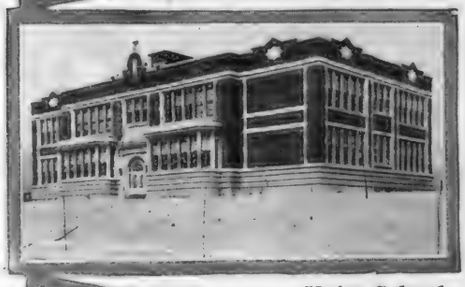


Free Engineering Service

Bayley Engineers designed these installations and will do the same for you without placing you under any obligation. Just tell us when you want them to call on you.

Bayley Mfg. Co.
Milwaukee, Wis.

Watson School



Unita School

Douglas School

Buckeye Multiblade Fans

are made especially for low pressure Heating and Ventilating work. They are giving perfect satisfaction.

CORRECT DESIGN. HEAVY CONSTRUCTION, NOISELESS OPERATION, WORKMANLIKE FINISH, HIGHEST EFFICIENCY.

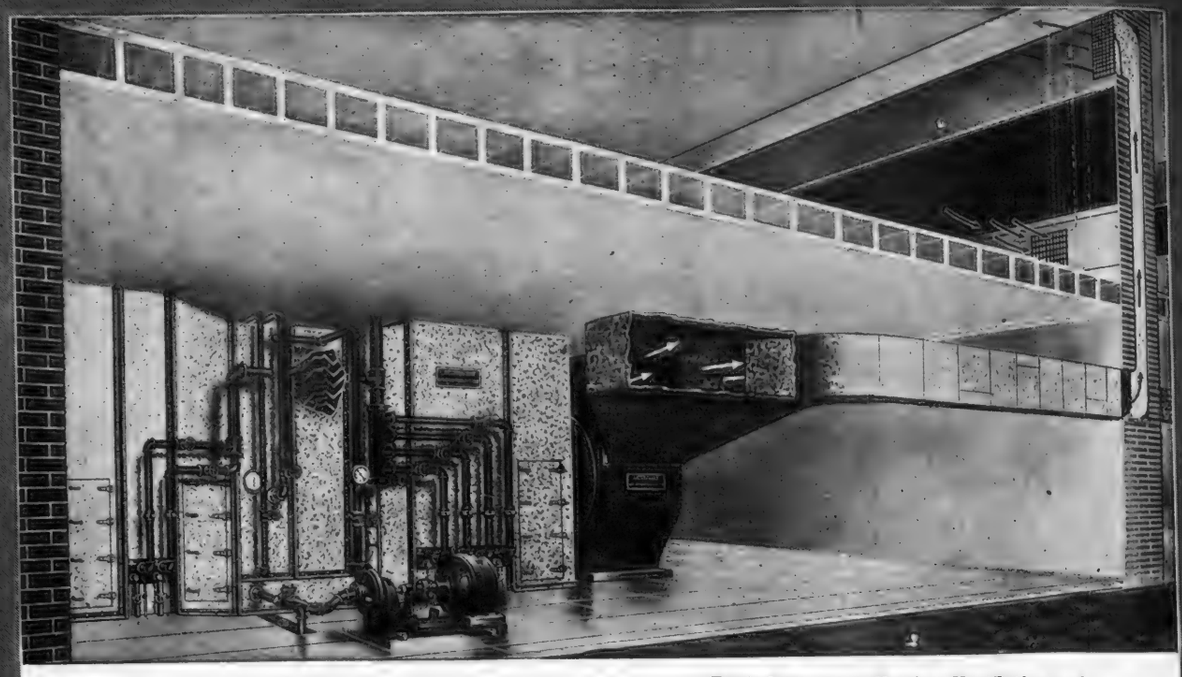
Our Engineering Department is maintained for the purpose of assisting Engineers, Architects, etc., in planning efficient Heating and Ventilating Systems for all buildings.

THIS DEPARTMENT IS FREE TO YOU.

We also manufacture a complete line of Disc, Cone and Steel Plate Fans.

Write Department D

BUCKEYE BLOWER CO.
COLUMBUS OHIO.



Typical Sturtevant Heating, Ventilating and Air Conditioning Installation.

Speed Up!

PRODUCTION - PROFITS - HEALTH

Clean, purified factory air keeps employees healthy and contented. Satisfied workmen are more efficient. They produce more and better work, which yields larger dividends for manufacturers.

Sturtevant
(REG. U. S. PAT. OFF.)

HEATING—VENTILATING—AIR CONDITIONING
SYSTEMS

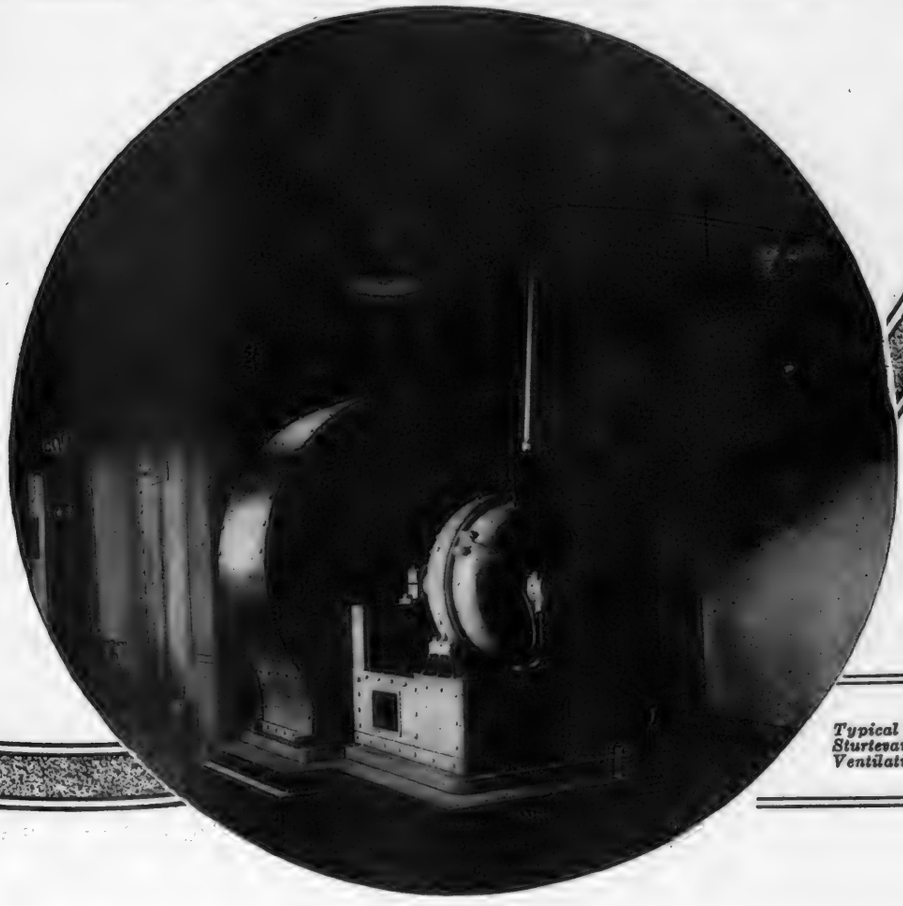
—insure a positive and constant supply of purified air, heated, cooled, humidified, or dehumidified—as required. The ideal manufacturing condition in *any* plant can be reproduced *every* day in the year by Sturtevant systems, which operate irrespective of outside weather conditions. All systems are scientifically designed to the needs of the plant.

The refinements in design, material, and construction of Sturtevant Fans, Heaters, Air Washers and driving apparatus account for the continuous dependability and operating economy of Sturtevant Heating, Ventilating, and Air Conditioning systems. Request our engineering department to make a study of your plant and submit a plan and an estimate of your requirements. No obligation incurred. For your convenience twenty-three Sales Engineering branches are maintained in the leading business centers. Bulletins of specifications, apparatus, and installations on request.

B. F. STURTEVANT COMPANY

HYDE PARK, BOSTON, MASS. **AND ALL PRINCIPAL CITIES**

Sturtevant
PUTS AIR TO WORK



Typical Installation of a Sturtevant Heating and Ventilating System.

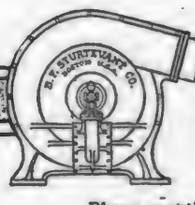
There can be no Question as to the Efficiency of a Sturtevant System

Sturtevant engineers have spent years in the developing of Sturtevant Heating and Ventilating Systems. They have made exhaustive study of every condition under which Sturtevant Systems are to operate.

The great number of Sturtevant installations in every type of public building and industrial plant, the success of each installation and the satisfaction due to the efficiency of the apparatus in providing an abundance of fresh heated air, is proof enough that Sturtevant Systems are absolutely beyond question in reliability.

B. F. STURTEVANT CO., Hyde Park, Boston

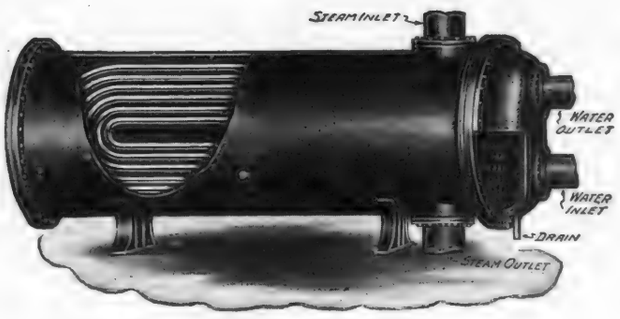
AND ALL PRINCIPAL CITIES



Sturtevant

REG. U.S. PAT. OFF.

PUTS AIR TO WORK



A swimming pool has to stand publicity. If it is not a conspicuous success, it is a conspicuous failure. There is no middle ground.

Whitlock Swimming Pool Heaters are performing this special service successfully throughout the country, because *they were designed for the purpose.*

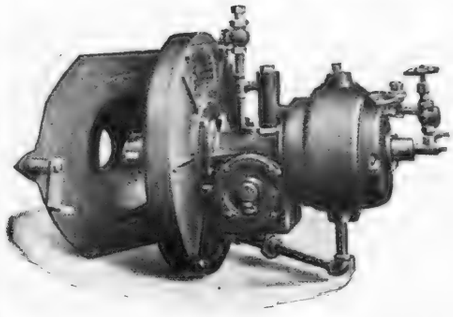
Write our nearest engineer. He will be glad to give you further details.

WHITLOCK COIL PIPE CO.

NEW YORK CHICAGO BOSTON PHILADELPHIA

Agents in all Principal Cities

CUT THE HIGH COST OF FUEL



USE THE

Ray Rotary Crude Oil Burners

FOR STEAM AND HOT WATER BOILERS

Adapted to Any Type of Boiler or Furnace

High or Low Pressure, 10 to 300 H. P.

Write for Circular H

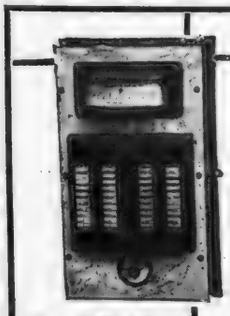
W. S. RAY MFG. CO., 29 Spear St., San Francisco, Cal.

Manufacturers of Ray Crude Oil Burners, Ray Heavy Steel Oil, Gas, Coal or Wood Ranges

Insure your Stripping with Reliable Strips

Weather Strip Manufacturers Association:

American Metal Weather Strip Co., Grand Rapids, Mich.
Athey Co., - - - - - - - Chicago, Ill.
Diamond Metal Weather Strip Co., - Columbus, Ohio
Higgin Mfg. Co., - - - - - - Newport, Ky.
Kane Mfg. Co., - - - - - - - Kane, Pa.
Monarch Metal Products Co., - - St. Louis, Mo.
Niagara Metal Weather Strip Co., - Buffalo, N. Y



No. 420 Wall Cabinet, one of several types manufactured, adapted for indicating and recording temperature.

The Cleveland Electric Thermometer affords the custodian or engineer means of instantly and accurately determining the temperature of any room or the outside atmosphere, without leaving his office.

This results in uniform heating, complying with state and municipal laws pertaining to public buildings and also saves fuel.

The Cleveland Instrument Co.
6523 Euclid Ave., Cleveland, Ohio
New York Reps.: Herman H. Stright & Co.

Where Equipment Perfection Counts

Ventilating Motors and Controllers that Assure Continuous Service

You decide that to obtain ample ventilation certain kinds of equipment must be selected from the standpoint of application and requirements.

Westinghouse ventilating motors and controllers are designed and manufactured to meet every requirement, and to fulfill these for years after the installations are made.

In all the large cities of the United States, Westinghouse Ventilating Equipment can be found operating with such perfection that it requires no attention except for an occasional oiling and inspection.

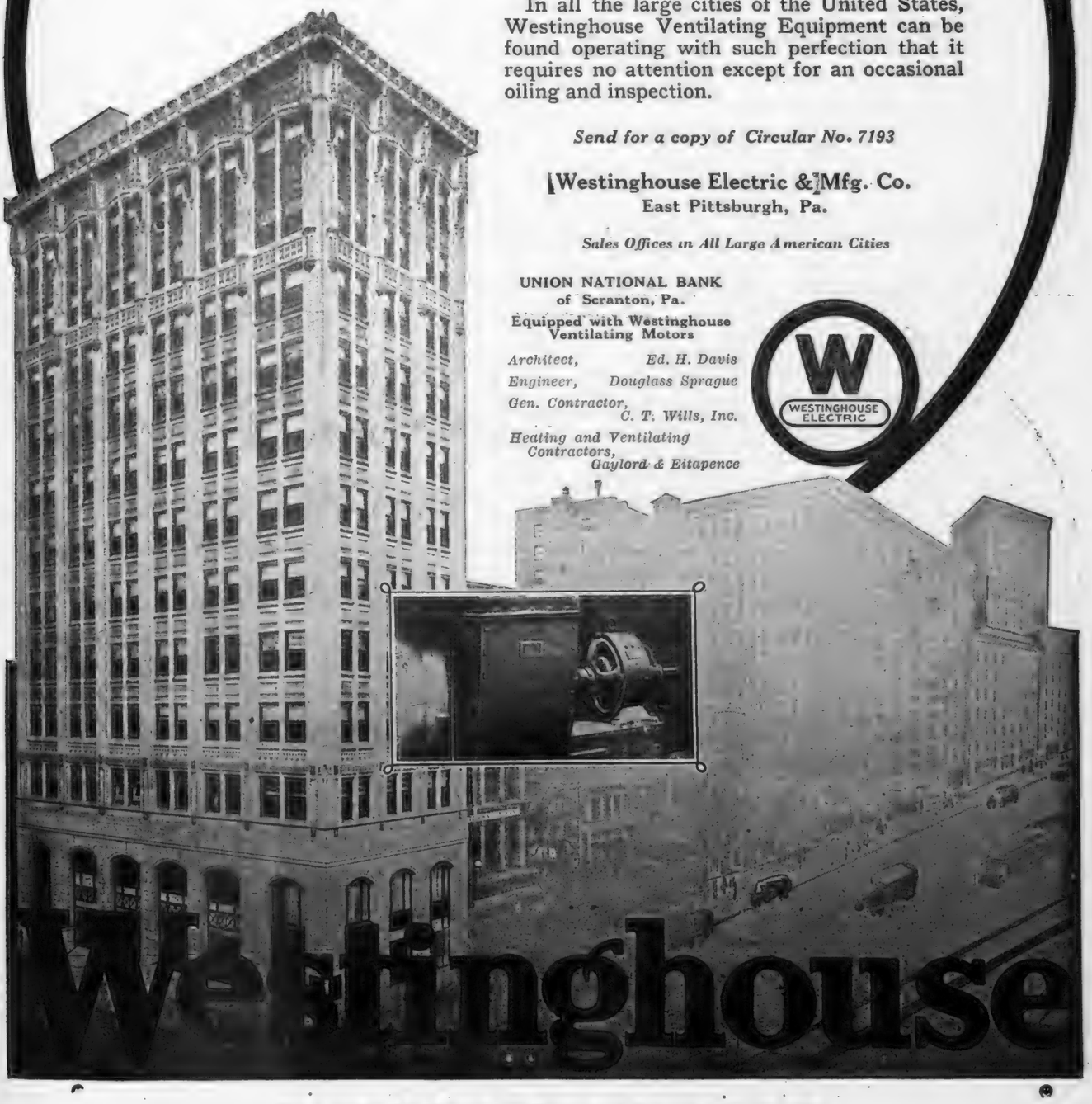
Send for a copy of Circular No. 7193

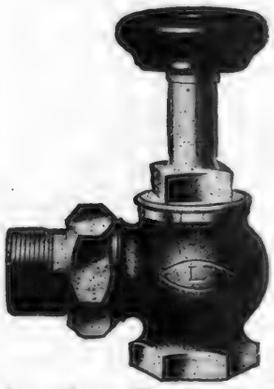
Westinghouse Electric & Mfg. Co.
East Pittsburgh, Pa.

Sales Offices in All Large American Cities

UNION NATIONAL BANK
of Scranton, Pa.
Equipped with Westinghouse Ventilating Motors

Architect, Ed. H. Davis
Engineer, Douglass Sprague
Gen. Contractor, C. T. Wills, Inc.
Heating and Ventilating Contractors, Gaylord & Eitapence





Lavigne Packless Wood Wheel Handle

CORRECTLY ENGINEERED

Valves are a very important part of any steam or vapor heating installation and it is highly essential that they be correctly designed for the service they are called upon to render.

LAVIGNE PACKLESS QUICK—OPENING STEAM RADIATOR VALVES

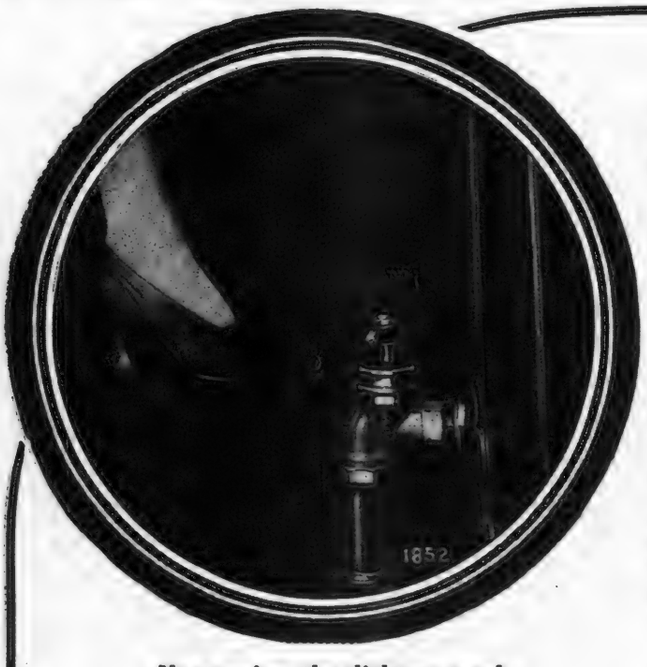
have been tested by a great many years of strenuous service and the engineering principles involved in their construction have been proven absolutely correct.

These valves Positively do not leak air, water or steam
Open quickly and close just as quick. Are correctly proportioned and properly manufactured.

BUILT RIGHT———TO STAY RIGHT

Made in six sizes, many styles of handles—All good jobbers handle them.

COMMONWEALTH BRASS CORP. DETROIT, MICH.



No stooping, the slightest touch of the foot operates the valve

A Quarter Turn of the Handle Opens or Closes the GORTON QUARTER-TURN VALVE

It is the easiest operating valve in the world, and users will regulate heat in a room by opening and closing the radiators, saving steam.

With the old time valve requiring five or six turns of the wheel to open or close the valve users open the windows to cool a room, an immense waste of steam.

Wasted steam is wasted coal.

Equip your radiators with Gorton Valves and save money on your Coal Pile.

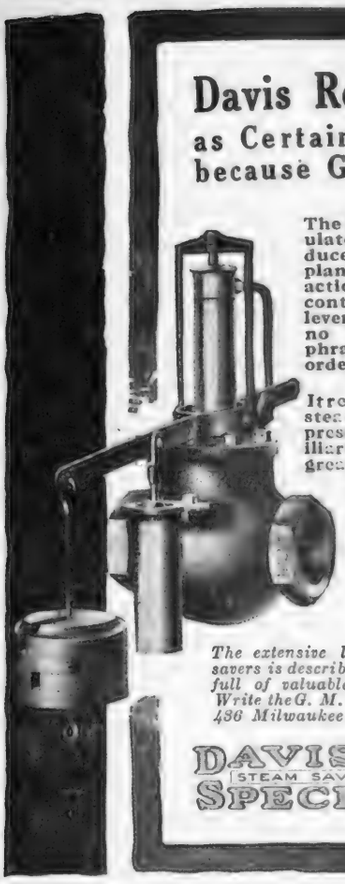
Write for Catalogue

Gorton & Lidgerwood Co.

FISHER BLDG., CHICAGO, ILL. 100 LIBERTY ST., NEW YORK, N. Y.

See Sweet's Architectural Catalogue, Page 1635, for Specifications

Davis Regulator—
as Certain as Gravity because Gravity-controlled



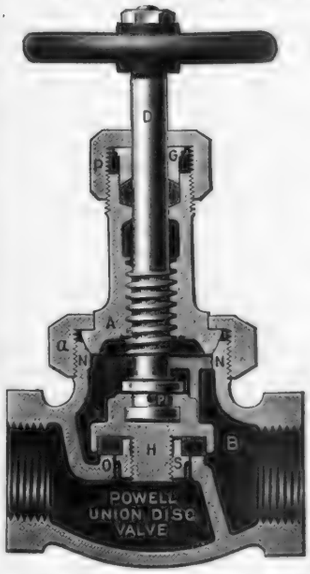
The Davis Pressure Regulator when used to reduce steam for heating plants is positive in action because gravity controlled by weighted lever arm—no packing—no springs nor diaphragm to get out of order.

It reduces high pressure steam to the exact lower pressure at which auxiliary apparatus gives greatest efficiency and economy. Supplies uniform pressure regardless of fluctuations in boiler pressure.

The extensive line of Davis steam savers is described in a catalog chuck-full of valuable steam-saving data. Write the G. M. Davis Regulator Co., 436 Milwaukee Ave., Chicago.

DAVIS VALVE
STEAM SAVERS SINCE 1875
SPECIALTIES

POWELL VALVES
Union UNION COMPOSITE DISC VALVE Disc
For Steam, Gas, Oil or Air



Notice the Union Bonnet Connection

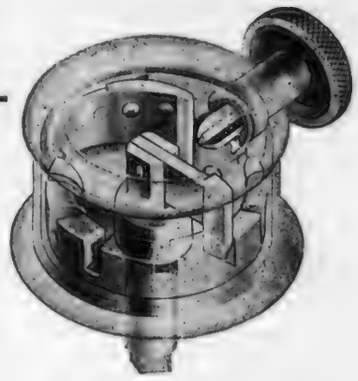
Steam Bronze Composition Body and Trimmings

Vulcanized Composition, White Metal or Bronze Discs

Screwed or Flanged Ends

Ask for

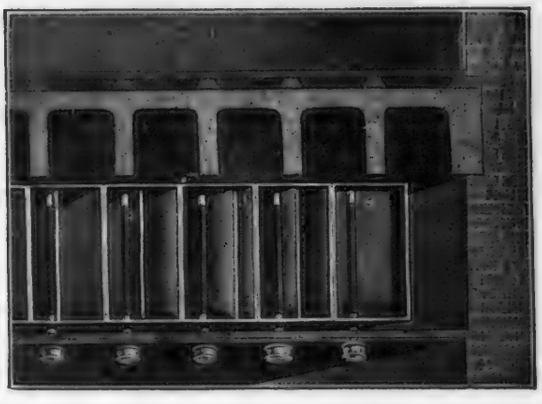
POWELL UNION DISC VALVES
THE WM. POWELL CO.
CINCINNATI, OHIO



This is the Key to Good Ventilation

THE PERFECTO DAMPER REGULATOR AND INDICATOR

when placed on a battery of ducts in the collecting chamber near the machinery room, not only affords an easy and convenient means of regulating the flow of air, but also serves as a positive means of indicating the room to which each duct leads, by means of the numbered or lettered cover windows.



Let us send you further particulars

The Sixth City Sheet Metal Works Co.
Cleveland, Ohio
Office and Factory, 1830 St. Clair Avenue

Banner Rock Wool Quilt
100% Fire Proof

INSULATION
FOR
HOT SURFACES

Cut shows typical installation of Banner Rock Wool Quilt on Boiler of Apartment House after 4 Years' Service

DISTINCT ADVANTAGES.

1 MOST EFFICIENT (by Government tests)
2 EASE OF APPLICATION
3 FLEXIBILITY
4 CAN BE TEMPORARILY REMOVED TO MAKE REPAIRS
5 LOWEST INITIAL COST

"More Insulation for Money Invested"

Send for Information

Banner Rock Products Co.
Alexandria, Ind.

the good Old Globe
has rolled 'round thru another year

and tho' there've been many trials and tribulations—'times that have tried men's souls'—we're still on a pretty even keel with all sails set for the **port ahead**

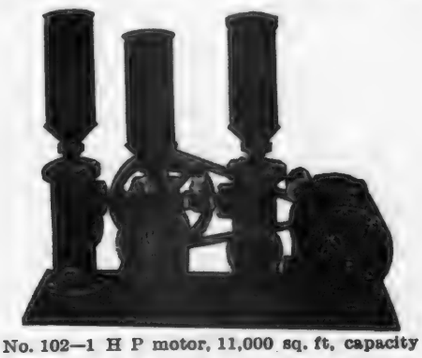
Mrs. Wiggs of the Cabbage Patch said, among other things—"there's a heap more in smilin' than in sighin'"

and Mrs. Wiggs was right—quite **right**

Now—'all together' with
A Most Merry Christmas
and
A Very Happy and Prosperous New Year

Patterson-Kelley
Water Heating Engineers
Manufacturers of the Patterson System of Water Heating for all service using hot water
23 Dey St.
New York

Thompson Vacuum Pumps



No. 102—1 H P motor, 11,000 sq. ft. capacity

Simple—Sturdy—Silent

Complete equipment and assembled and tested at factory. Shipped to job assembled ready to operate.

The only rotary vacuum pump which will either maintain a vacuum of 20" or discharge against a 20 lb. boiler pressure.

Equipment sizes range from 5,000 to 35,000 sq. ft. radiation. Send for bulletin B-3

THOMPSON MANUFACTURING CO.
811 24th Street Des Moines, Iowa

FOR UNDERGROUND STEAM OR HOT WATER PIPES
THE ORIGINAL
RIC-WIL METHOD

embodies more original ideas, more advanced engineering, and more good practical features than any other system on the market. The material, construction, installation methods and practical results which, combined, form what we call the RIC-WIL Method, appeal with equal force to the engineer, to the practical operating man and to the business executive. Let us send you a copy of our descriptive Bulletins 1-3.
Write to-day.

The RIC-WIL COMPANY
CLEVELAND

Dependable Warmth; and besides—

a service that goes the whole way in assuring complete satisfaction.

Webster Heating equipment is the result of more than 30 years of leadership in the development of heating systems.

Over 6000 installations of every conceivable size and arrangement testify to the invariable excellence of Webster apparatus and the ability of the Webster organization to solve every heating problem that has been put up to it.

And the

Webster

policy of friendly co-operation begins even before the building plans are made, is offered irrespective of the chance of making a sale, and lasts throughout the life of every Webster installation. Engineers, architects, contractors, and owners can be assured of every assistance that will help to make each Webster Heating System completely satisfactory and a credit to all concerned.

63

WARREN WEBSTER & COMPANY
Main Office and Works: CAMDEN, N. J.
Branches in principal cities

Scottish Rite Cathedral
Dallas, Texas
Equipped with Webster Modulation System of Steam Heating

Meet that Peak Demand for Hot Water

WITH A

Sims Clean E-Z Steam Tube Heater

For Hotels, Apartment Buildings, Hospitals, Y. M. C. A. Buildings, Schools, etc.

For Live or Exhaust Steam

Especially Designed for Supplying Large Quantities of Hot Water

Send for tables showing heat capacities using steam at various pressures

"We keep others in hot water"

THE SIMS CO., 18th St., Erie Pa.

The New Excelso Water Heater

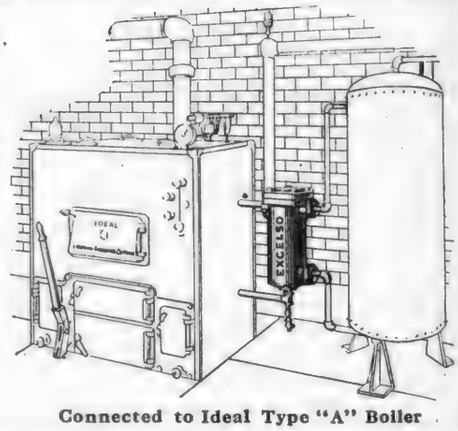
Eliminates Fire-Pot Pipe Coils

The Excelso Heater, connected below the water-line of steam or vapor boilers, will generate domestic hot water constantly, day and night, as long as there is any fire, at practically no cost.

The copper coil is connected into heater without packing. Made in five sizes for tank capacities as follows:

No. 11	No. 12	No. 13	No. 14	No. 15
30 gal.	45 gal.	70 gal.	90 gal.	120 gal.

EXCELSO SPECIALTY WORKS
119 Clinton St. Buffalo, N. Y.

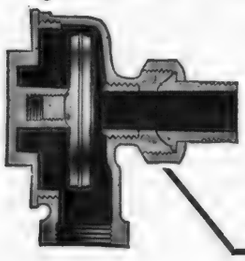


Connected to Ideal Type "A" Boiler

The "IDEAL" Trap

IN NAME - IN PRINCIPLE - IN SERVICE

For all Return Line Heating Systems—
Vapor, Vacuum or Straight Steam



1. Fool Proof.
2. Less Complicated.
3. A "Protected" Diaphragm.
4. Vertical Self Cleaning Seat.
5. Highest Radiator Efficiency.

Ideal Heating Equipment Co.
1897 E. 90th St. Cleveland, Ohio

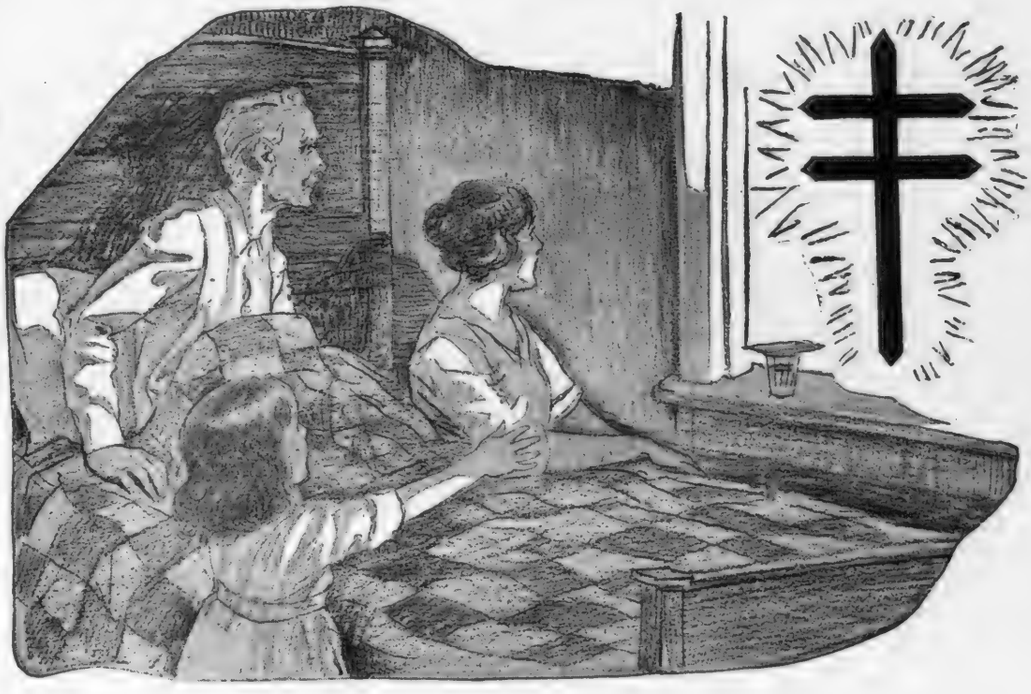
STERLING SYSTEMS

STERLING SYSTEMS

Vacuum and Vapor Heating Specialties

Thermostatic Traps—Air Line Valves—Graduated Supply Valves—Air Eliminators—Damper Regulators—Return Traps

STERLING ENGINEERING COMPANY
Milwaukee Wisconsin



Their Christmas Vision

Racked and torn with the scourge of tuberculosis, thousands of unhappy homes have but one Yuletide hope—one year 'round vision—victory over this disease which is sapping mother, father and baby lives. Each penny Christmas Seal you buy brings help that much nearer to them—a vision realized

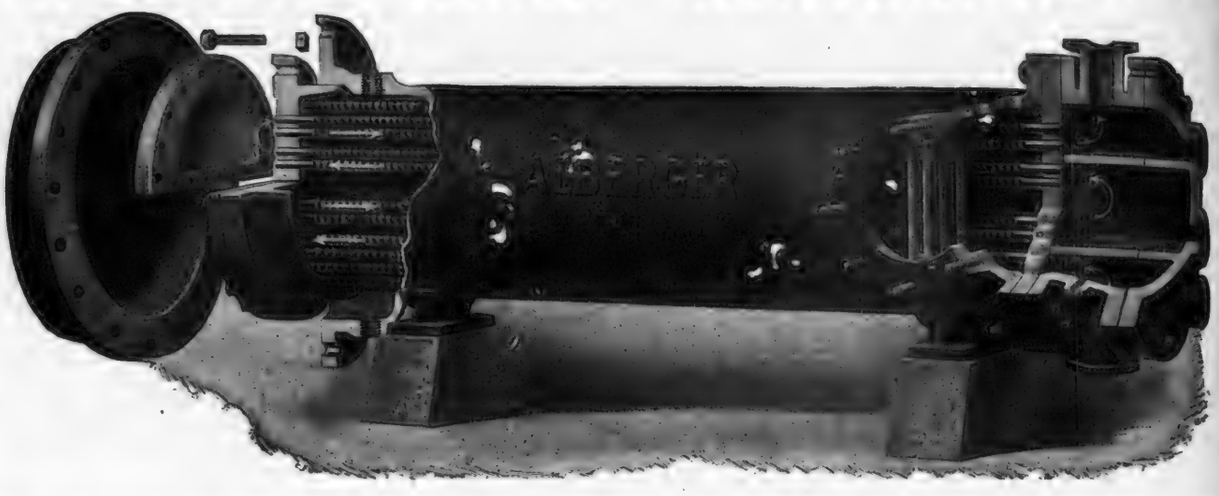
Buy Tuberculosis

Use Christmas Seals

For sale in booths—and stores—everywhere—by over one thousand local and state tuberculosis associations.

NATIONAL TUBERCULOSIS ASSOCIATION
381 FOURTH AVENUE NEW YORK CITY

ALBERGER—Buffalo—Multi-Head Heaters



will save you money in both operating and repair costs.

The multi-pass design with the small diameter, helically corrugated, straight, pure copper tubes insures very rapid heating and prevents adhesion of scale through the scouring action of the water as it whirls through the tubes.

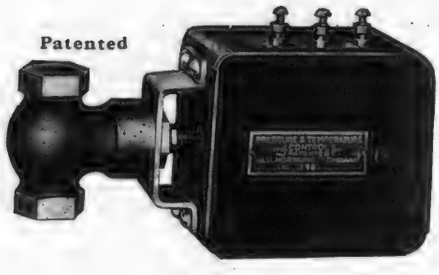
The use of a divided floating head compensates for the unequal expansion of the tubes and eliminates leaky heads, split tubes, warping and other tube faults.

Your hot water problem is a special one. Ask our engineers to solve it. No obligation for this service. Write

ALBERGER HEATER CO., BUFFALO, N. Y.

Offices in All Principal Cities CANADIAN FAIRBANKS-MORSE CO., Agents for Canada

Patented



The HORNUNG Magnetic Valve

This is the little valve used as a pilot on all sizes of HORNUNG PRESSURE and TEMPERATURE CONTROL VALVES. It has many other uses.

Ask for Catalog No. 14

CENTRAL HEAT APPLIANCES

J. C. HORNUNG

343 South Dearborn Street **CHICAGO**

BADGER
Will prevent leaks in air, water, gas, oil, and all pipe lines.
Self Equalizing Expansion Joints
E. B. BADGER & SONS CO.
101 PARK AVE. NEW YORK
75 PITTS ST. BOSTON
616 S. MICHIGAN AVE. CHICAGO

UNIMPORTANT NOTICE

"A helpful idea for winning a steam job for a residence, flat or apartment from your competitor is hanging radiators on Hartmann Radiator Brackets. The ease with which the floor under a suspended radiator can be kept clean appeals especially to a woman. So does the neat appearance. The woman of the household usually decides matters of interior equipment. See her if possible. Any real estate man will tell you to please the woman and the rest is easy.

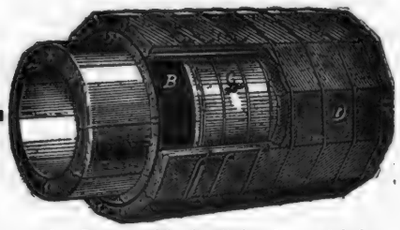
Hartmann Radiator Brackets require only one half as much labor to hang a radiator as ordinary cast iron brackets. They cost less than half as much. They require no wall strips. They are cleanly. They do not break. They will pay any steam contractor. Send for description and prices to Charles Hartmann Co., 985 Dean St., Brooklyn, N. Y

DAHLQUIST BOILERS | LEAD

Made of Pure Copper by the largest manufacturers of Hot Water Tanks in the United States.

Let us figure on your requirements

DAHLQUIST MFG. CO.
40 West 3rd St. BOSTON, MASS.



A—Inner Shell, 2 inches thick.
B—Asphaltum Packing.
C—Dead Air Space.
D—Outer Shell, 1 inch thick.

Cover Your Steam Pipes

WITH WYCKOFF'S IMPROVED

CYPRESS COVERING

Made of Gulf Cypress, the wood eternal

Not affected by wet and dry conditions common to steam-pipe trenches. Will not rot. Absolutely water and steam tight. Each shell is wound with extra-heavy steel wire. Coated all over with the best known preservative—**Montezuma Asphalt.**

Let us answer your questions and tell you all about it. Booklet on request.

A. WYCKOFF & SON COMPANY

ELMIRA . . N. Y.

BRANCHES:

Atlanta, Ga., H. H. White, 1503 Fourth National Bank Building

Pittsburgh, Pa., Johnson-Peter Co., Pittsburgh Terminal Warehouse

Scranton, Pa., Valley Supply Co., Coal Exchange Building

If You have not a Set of Our Catalogs, Get It Today

Steam, Vacuum Compound, Altitude, etc.

"S&B"
Thermometers for all applications

It is more than a catalog—it is a text book on Instruments for Indicating and Reading Pressure, Vacuum Draft, Temperature, etc.

Write for Special Catalog Set HV, Today

The Schaeffer & Budenberg Mfg. Co.
BROOKLYN, N. Y.

Chicago Pittsburgh Washington
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Also many other Allied Instruments, Gauge Boards and Complete Equipment

MANUFACTURERS OF

Equipment and Supplies for Central Station Heating Plants.

Copper-Diaphragm Expansion Joints. | **Slip Joints, Anchor Crosses, Line Anchors.** | **Collars, Manhole Curbs, Pipe Guides**

The Detroit Condensation Meter
The Detroit Feed Water Meter

CENTRAL STATION STEAM CO.
DETROIT, MICH.

Chicago Office: 902 First National Bank Bldg.
Minneapolis Office: 802 Metropolitan Life Bldg.

Ross

Surface Barometric and Jet Condensing Equipments for Power Plants. Main, Auxiliary, Distilling Condensers & Evaporators for Marine Service. Distilling Condensers for Refrigeration and Chemical Plants.

"Crosshead Guided" Expansion Joints. Ross Boiler Feed Water Heaters. Ross Oil and Sugar Juice Heaters. Gravity & Forced Circulation Heaters. Ross Oil, Air and Water Coolers.

ROSS HEATER & MFG. CO., Buffalo, N. Y.

THE BRAND THAT LEADING ENGINEERS DEMAND

Economy Motor, Belt or Power Driven Vacuum and Boiler Feed Pumps

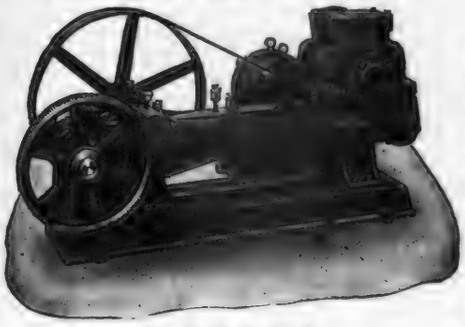


Fig. 2149—Type B

EDUCATE YOUR CUSTOMERS

to that definite understanding of

What Happens to the temperature in their buildings **When Fires are Banked**

If they use Economy Automatic Electric Vacuum Pumps, there will always be a moderate amount of heat in the coils and radiators when Banked Fires are so arranged that the water will be about 200 degrees, or slightly below the boiling point. Banked fires usually keep the water above 200 degrees. The pump will pull a vacuum right back to the boiler and then shut off. This keeps a mild vapor in the heating surface all night. No other method known at present will do this.

Our heating and steam engineers are your men when handling any matter placed in our care.

We Sell Through the Trade

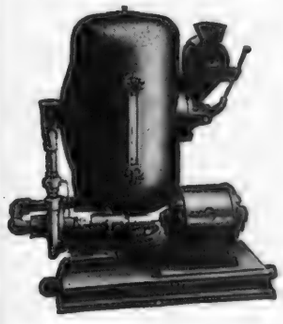
AUTOMATIC ELECTRIC

Condensation Pumps Water Systems Sewage Ejectors Cellar Drainers
Self Priming Centrifugal Pumps Return and Air Line Vacuum Pumps

ECONOMY PUMPING MACHINERY CO., 120-128 No. Curtis St., Chicago, Ill.

"ADVANCE" CONDENSATION PUMPS

For Low Pressure and Vapor Heating Systems

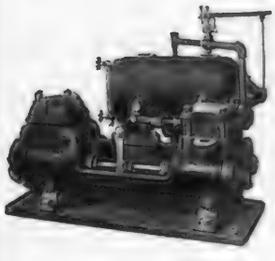


Electric Motor Driven
Automatic in Operation

Obtain absolute protection against overloading and burning out of motor by using "ADVANCE" Condensation Pump and Receiver Equipment.

Write now for Bulletin HV-205

Ten to thirty pounds pressure for 1,000 to 50,000 sq. ft. Electric current to suit. Large units special.



"Advance" Automatic Feed Pumps and Receivers

Fifteen to two hundred fifty pounds pressure for 1,000 to 60,000 sq. ft. Larger units special.

For the highest efficiency units
Write for Bulletin HV-218

Advance Pump and Compressor Co.
BATTLE CREEK, MICH.

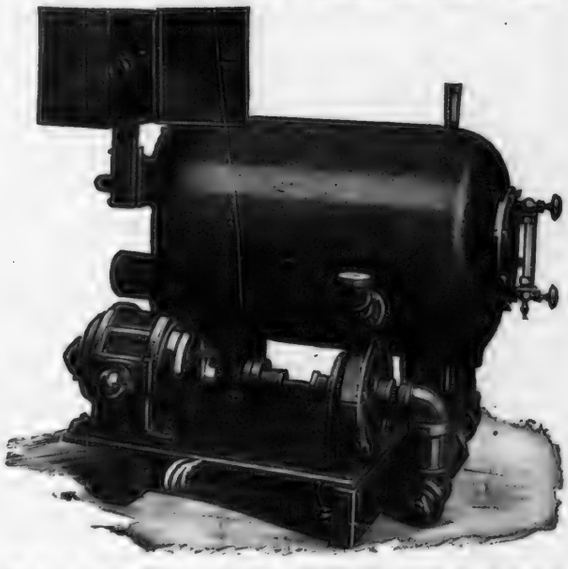
SAVE CONDENSATION

AND RETURN IT HOT TO BOILERS

ARCHITECTS AND ENGINEERS

designing new plants generally provide for economical equipment, but there are many existing low pressure steam heating plants where a surprising amount of fuel could be saved by the installation of

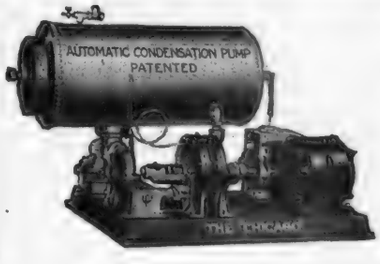
Yeomans Electrically Operated Condensation Return Pumps



Made in Horizontal and Vertical Types for automatic operation

Send for Bulletin C-5100 Agents in all principal cities

YEOMANS BROTHERS CO., 1421 Dayton St., Chicago, Ill.



The Entire Heating Plant

depends on the condensation pump and receiver, THEREFORE SELECT THE SAFEST. Compare the merits of the "CHICAGO" TILTING TANK TYPE CONDENSATION PUMP AND RECEIVER with any other made, and you surely will select the Chicag ype. WE CAN MAKE ONE-WEEK DELIVERY on an size Condensation Pump.

CHICAGO PUMP CO., 2325 Wolfram St.

Manufacturers of Bilge Pumps, Sewage Ejectors. TURBINE HOUSE an HOT and COLD WATER CIRCULATING PUMPS

ENGINEERS' SPECIFICATION INDEX

AIR COMPRESSORS
Nash Engineering Co., So. Norwalk, Conn.

AIR CONDITIONING APPARATUS.
American Blower Co., Detroit, Mich.
Atmospheric Conditioning Corporation, Philadelphia, Pa.
Carrier Air Conditioning Co., Buffalo, N. Y.
Carrier Engineering Corporation, New York.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

AIR COOLERS
Alberger Heater Co., Buffalo, N. Y.
Badger & Sons Co., E. B., Boston, Mass.
Griscom-Russell Co., New York.

AIR COOLING AND DRYING SYSTEMS.
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Carrier Engineering Corporation, New York.
Clarage Fan Co., Kalamazoo, Mich.
Hersh & Bros., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

AIR ELIMINATORS
Jas. P. Marsh & Co., Chicago, Ill.

AIR SEPARATORS
Griscom-Russell Co., New York.
Hoffman Specialty Co., New York.

AIR WASHERS.
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Atmospheric Conditioning Corp., Phila., Pa.
Badger & Sons Co., E. B., Boston, Mass.
Buffalo Forge Co., Buffalo, N. Y.
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Carrier Engineering Corporation, New York.
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Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Spray Engineering Co., Boston, Mass.
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Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Skinner Bros. Mfg. Co., St. Louis, Mo.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

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Connersville Blower Co., Connersville, Ind.
Hersh & Bro., Allentown, Pa.
Ilg Electric Ventilating Co., Chicago, Ill.
Massachusetts Blower Co., Watertown, Mass.
New York Blower Co., Chicago, Ill.
Sturtevant Co., B. F., Hyde Park, Boston, Mass.
L. J. Wing Mfg. Co., New York.

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L. J. Wing Mfg. Co., New York.

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Gorton & Lidgerwood Co., New York.
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Page Boiler Co., Wm. H., New York.
Utica Heater Co., Utica, N. Y.

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Illinois Malleable Iron Co., Chicago, Ill.
Page Boiler Co., Wm. H., New York.
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New York Blower Co., Chicago, Ill.

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Oil.
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Alberger Pump & Condenser Co., New York.
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Carrier Engineering Corporation, New York.
New York Blower Co., Chicago, Ill.
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Howard & Morse, New York.

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Hornung, J. C., Chicago, Ill.
Illinois Engineering Co., Chicago, Ill.
Johns-Manville Co., New York.
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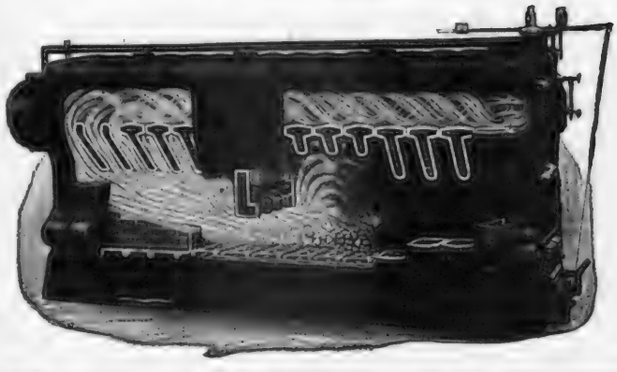

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Lynchburg Foundry Co., Lynchburg, Va.
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Simmons Co., John, 110 Center St., New York.

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American Steam Pump Co., Battle Creek, Mich.
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Ideal Heating Equipment Co., Cleveland, O.
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Buffalo Steam Pump Co., Buffalo, N. Y.
Connersville Blower Co., Connersville, Ind.
Economy Pumping Machinery Co., Chicago, Ill.
Farnsworth Co., Conshohocken, Pa.
McAlear Mfg. Co., Chicago, Ill.
Nash Engineering Co., So. Norwalk, Conn.
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Farnsworth Co., Conshohocken, Pa.
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McAlear Mfg. Co., Chicago, Ill.
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National Regulator Co., Chicago, Ill.
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L. J. Wing Mfg. Co., New York.

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Foster Engineering Co., Newark, N. J.
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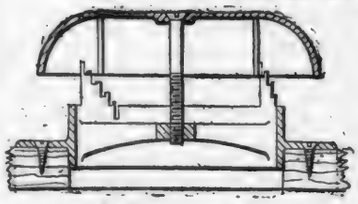

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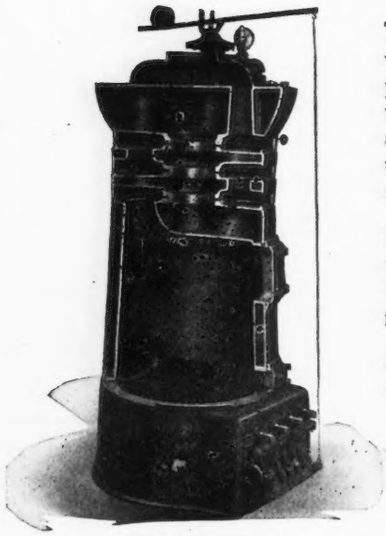

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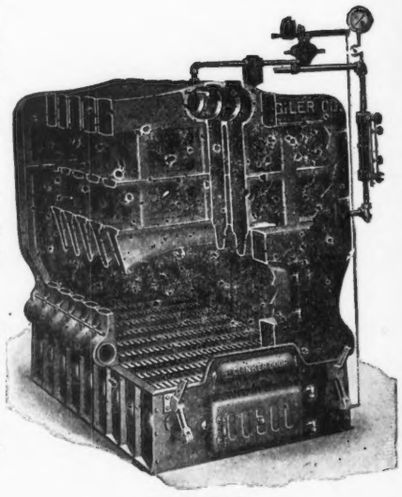

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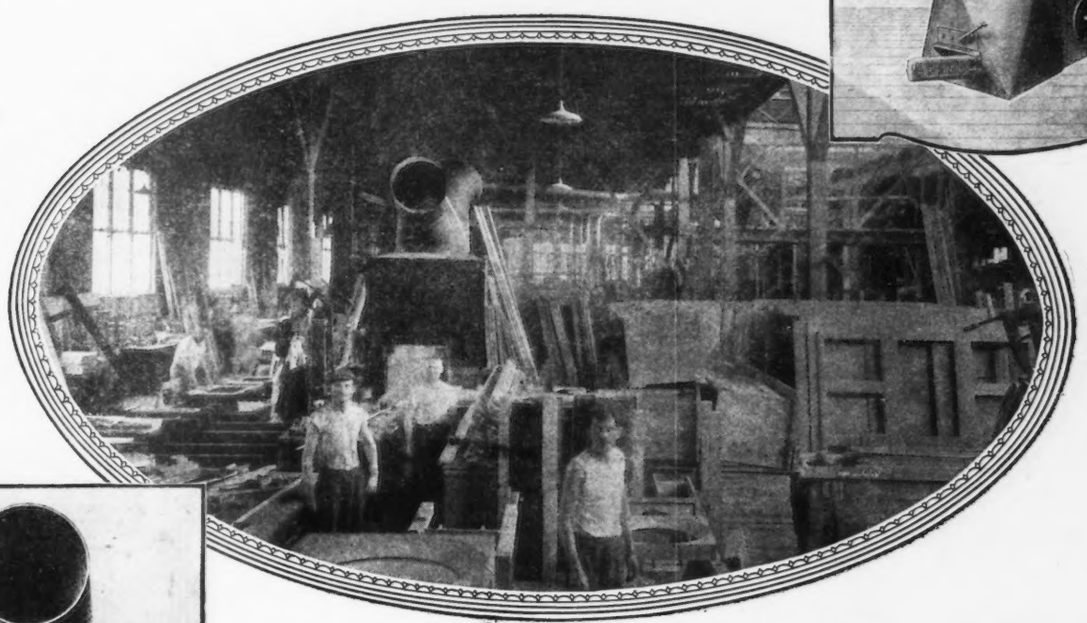

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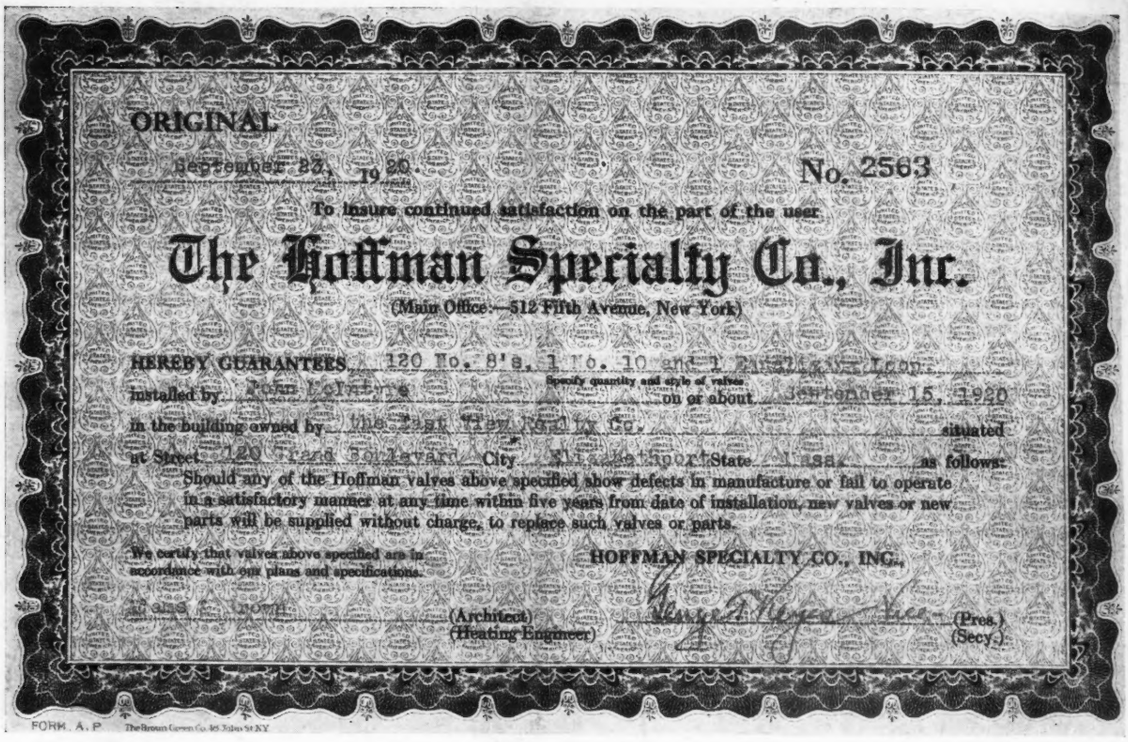

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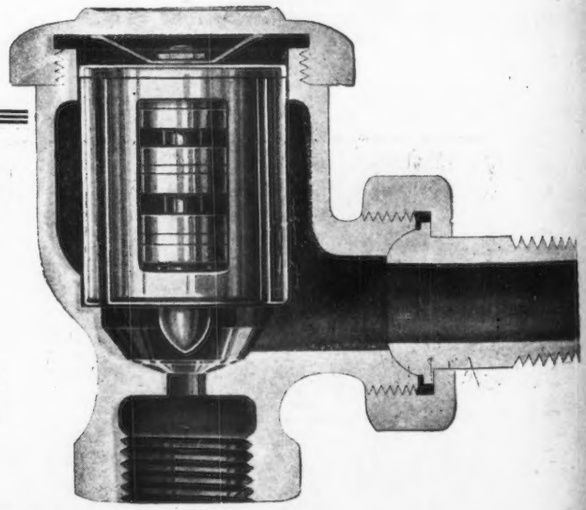
HOFFMAN VALVES

Venting Valves for Every Purpose



The No. 8 Hoffman Return Line Valve, for vapor, vapor vacuum, modulating and vacuum systems.